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Abstract

The report offers an analysis of the R&I system in the Slovak Republic for 2014, including relevant policies and funding, with particular focus on topics critical for two EU policies: the European Research Area and the Innovation Union. The report was prepared according to a set of guidelines for collecting and analysing a range of materials, including policy documents, statistics, evaluation reports, websites etc. The report identifies the structural challenges of the Slovak research and innovation system and assesses the match between the national priorities and those challenges, highlighting the latest policy developments, their dynamics and impact in the overall national context.

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Executive summary

The report was prepared according to set guidelines for collecting and analysing a range of materials, including policy documents, statistics, evaluation reports, websites, etc. The quantitative and qualitative data is, whenever possible, comparable across all EU Member State reports. The report provides an up-to-date overview of the R&I system, including funding in the Slovak Republic in 2014.

Slovak gross expenditure on research and development (GERD) was €610.9m (0.83% of GDP) in 2013 (2012: €585.5m and 0.81% GDP). The 2014 National Reform Programme for the Slovak Republic set 2020 targets for GERD and business expenditure on research and development (BERD) at 1.2% and 0.8% respectively. The total GERD was dominated by three major flows i) government to government sector (13.4%), (ii) government to higher education sector (23.1%) and (iii) business to business sector (37.6%) in 2013. Industry – academia flows were quite unimportant.

National research and development policies are drafted, implemented and co-ordinated by the Ministry of Education, Science, Research and Sports (MESRS). The Slovak Government Council for Research, Development and Innovations (SGCSTI) is an advisory body of the Slovak Government in matters of science, research and innovation. The secretariat of the council is administrated by the MESRS. The MESRS and the SGCSTI guided the preparation of the Smart Specialisation Strategy (the RIS3 document) for 2014-2020.

The key challenges in the national innovation system have been continuing for many years and have been identified in the key government documents on innovation policies: (i) a weak R&D system and poor co-operation between academia and industry sectors; (ii) an underdeveloped system of innovation governance; (iii) a dual economy; (iv) low shares of domestic innovative enterprises limiting the competitiveness of the country; (iv) inadequate national research and innovation funding.

These challenges are addressed by four strategic goals set by the RIS3 document. Goal 1 tackles the challenge of the dual economy and aims at increasing the embeddedness of key industries in Slovakia. Goal 2 relates to the support for economic growth via the results of excellent science. Goal 3 ‘Creating a dynamic, open and inclusive innovative society as a condition for improving quality of life’ contains three policy measures on grand societal challenges. Goal 4 ‘Improving the quality of human resources for an innovative Slovakia’ contains policy measures aimed at improving system of vocational education and supporting excellent higher education.

Most policy goals and policy measures of the RIS3 document will be implemented via the Operational Programme Research and Innovation (OPRI). The RIS3 document envisages a thorough reform of research and innovation governance and improved co-operation between academia and industry sectors. The challenges of a dual economy, low numbers of innovative enterprises and inadequate national funding are very complex. It may take decades to address them.

Slovak research funding tended to be quite generic. In 2012 the share of generic funding increased to 69.0%. The three most important themes (industrial production, agriculture and health) accounted for some 18.9% of the total GBAORD. The RIS3 document noted a lack of thematic focus and identified four key areas of economic specialisation: (1) automotive and mechanical engineering industries; (2) consumer electronics and electrical

equipment; (3) information and communication technologies and services, and (4) production and processing of iron and steel.

The Slovak research system has increasingly relied on European resources. The total assistance from Structural Funds into human resources, R&D and innovation was some €436m in the period 2004-2006 and increased to €5b in the period 2007-2013/15. European assistance, however, outnumbered national funding. The Slovak Government pointed to the availability of European resources for R&D funding and cut national support for research and development. The Slovak public R&D system almost exclusively relied on grants. Since 1 January 2015 tax 'super deductions' for R&D performers have been introduced. R&D performers can deduct from their tax bases 125% of all R&D costs plus up to 25% of labour costs in R&D in the current year. Moreover the R&D performers can deduct 25% of all R&D costs accrued in the previous year.

Slovakia had no roadmap for participation in joint research agendas and/or European Innovation Partnerships. Slovakia's participation in joint research agendas, joint calls, and joint programmes has developed on an ad hoc basis.

The SAS and Slovak HEIs may hire teaching staff, technical staff and/or researchers for fixed-term contracts and/or tenure, depending on their financial resources. The Slovak labour market for researchers is, in theory, fully open to EU and third country researchers. In practice, the Slovak labour market typically has low wages and high unemployment rates. There is also a considerable language barrier.

The Slovak Government used both European and national resources to implement policies for research and education-related public e-infrastructures and for associated digital research services. Slovakia, however, has no national policy on the open access to publications and data. The degree of openness influences the policies of particular universities and public research institutions.

The framework conditions conducive to business investment in research and innovation are underdeveloped in Slovakia. Slovakia has no law on support for innovation. The 185/2009 Law on R&D Stimuli distributes grants on a case-by-case basis. The amount of support depends on resources allocated from the State Budget. The introduction of tax reliefs for R&D performers may improve framework conditions for the development of applied research and innovation in Slovakia.

The science-based entrepreneurship and knowledge transfer is supported from national and European resources. The Operational Programme Research & Development supported some 93 Research and Development Centres (€190m), eight Competence Centres (€57.59m), and 11 University Science Parks (€300m) by the end of 2014.

The JEREMIE initiative provides risk capital for small and medium enterprises. The total capital allocated to the JEREMIE holding fund is €100m during the period 2007-2013/15. The pilot Innovation Voucher scheme continued in 2014. The value of each voucher increased to €5,000 and the total budget of the scheme to €235,000.

The innovative public procurement mostly concentrated on e-government projects and heavily relied on European resources. These projects generated mixed results. The Central Register of Contracts and the Electronic Identity Card are good examples of e-government projects. The e-Health and UNITAS (unifying tax, duties and social insurance payments) projects failed to deliver results by end of 2014.

The 2014 Innovation Union Scoreboard (IUS) data indicates that Slovakia has made a modest progress towards developing a knowledge-based economy since 2007. The absolute value of the Summary Innovation Index (SII) changed little during the period 2007-2013 (0.295 versus 0.328). The gap against the EU-28 SII value (0.517 versus 0.554) remained about the same. Slovakia's position against its main competitors in the region (the Czech Republic, Hungary and Poland) somewhat improved during the above-mentioned period.

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1. Overview of the R&I system

1.1 The Slovak Republic in the European RDI landscape

The Slovak Republic has an area of 49,034 square kilometres and a population of 5.4 million. It accounts for 1.11% of the area and 1.06% of the population of the EU28. Slovak per capita gross domestic product (GDP) (based on purchasing power parities) was €20,000 (75.2% of the EU28 average) in 2013. Slovak GDP (in total and also by per capita) grew by 1.6% in 2012 and 1.4% in 2013. The Eurostat estimated growth in Slovak GDP was for 2.2% in 2014.

Slovak gross expenditure on research and development (GERD) was €610.9m (0.83% of GDP) in 2013 (2012: €585.5m and 0.81% GDP). The 2014 National Reform Programme for the Slovak Republic set 2020 targets for GERD and the business expenditure on research and development (BERD) at 1.2% and 0.8% respectively.

1.2 Main features of the R&I system

The Slovak research and innovation system is highly centralised. Research, higher education and innovation have traditionally been considered matters of central government. A degree of institutional autonomy for eight NUTS III regions¹ was set by the 302/2001 Law on Self-Governing Regions. The Law makes no reference to competences in support for regional innovation and research systems. Support for human resources (secondary education in particular) is the most importance competence Slovak NUTS III regions have in the field of innovation development.

The public sector (central government) was a major provider of research funding in the 2000s. Since 2010 business resources and funding from abroad (European Commission) have significantly increased in importance.

The total Slovak GERD (€610.9m) was dominated by three major flows (i) government to government sector (13.4%), (ii) government to higher education sector (23.1%), and (iii) business to business sector (37.6%) in 2013. Industry – academia flows were quite unimportant. The flows from business to government, and business to the higher education sector accounted for 1.6% and 0.8% of total funding flows respectively in 2013. The structure of flows points to the poor interconnection between the public and private sectors. Slovakia ranked as the poorest research and innovation performer in the EU28.

The 2014 Innovation Union Scoreboard (IUS) data indicates that Slovakia has made a modest progress towards developing a knowledge-based economy since 2009. The state budget and Structural Funds are main sources of public support to R&D in Slovakia. The State Budget is the major source of national funding for public higher education institutions (HEIs) and the Slovak Academy of Sciences (SAS). Most national funding supports institutional finance. Structural Funds have provided the bulk of project funding in Slovakia since 2008. Combined competitive grants from the national and Structural Fund

¹ NUTS = Nomenclature of Territorial Units for Statistics.

resources provided over 30% of the total government allocation to HEIs and the SAS in 2013.

1.3 Structure of the national research and innovation system and its governance

National research and development policies are drafted, implemented and co-ordinated by the Ministry of Education, Science, Research and Sports (MESRS). The MESRS co-operates with other ministries (Ministries of Economy and Finance in particular), the Slovak Academy of Sciences, higher education institutions, and associations of employers, and industrial research organisations, respectively (Figure 1). The MESRS is responsible for policy- and decision-making in the field of R&D. The ministry uses a range of methods and instruments for policy making and co-ordination. The MESRS in particular: (i) drafts and consults all R&D and S&T policies with the most important R&D policy stakeholders; (ii) regularly evaluates the performance of state-funded R&D support schemes; (iii) prepares final and interim reports on the performance of the S&T strategies and policies; (iv) sets and implements principles for the block and competitive funding of higher education institutions (HEIs); (v) provides organisational, administrative and financial support to the Accreditation Commission for the higher education institutions, and (vi) manages a network of funding and implementing agencies (VEGA, KEGA, Slovak Research and Development Agency), and professional support agencies (Slovak Centre of Scientific and Technical Information, SCSTI).

The most important body for the co-ordination of S&T and innovation policies is the Slovak Government Council for Research, Development and Innovations (SGCSTI). The SGCSTI also is an advisory body of the Slovak Government in matters of science, research and innovation. The secretariat of the council is administrated by the MESRS. The council is chaired by the Prime Minister. Co-chairs of the SGCSTI are Minister of Education, Science, Research and Sport of the Slovak Republic, Minister of Economy of the Slovak Republic, Minister of Finance and Chairman of the Slovak Academy of Sciences.

The SGCSTI discusses and evaluates mainly conceptual, strategic and financial plans in science, technology and innovations designed for the Slovak Government, European Union bodies and international organisations.

Since 2007, responsibilities for the research and innovation policies are separated between the Ministry of Economy (ME) and the MESRS. Innovation policy measures are implemented by the ME and its agencies. This organisational division was prompted by introduction of the Structural Fund programmes. The ME implements the Operational Programme of Competitiveness and Economic Growth (OPCEG). The MESRS implements the Operational Programme Research and Development (OPRD) and the Operational Programme Education (OPE). As to manage the OPRD and OPE, the MESRS established the Agency of the MESRS for the Structural Funds of the European Union (ASFEU).

The MESRS supports basic and applied research via state budget allocations and competitive grants. Grants are given to a network of organisations and agencies important for the development of science & technology (S&T) and higher education. The key research performers include:

- The Slovak Academy of Sciences (SAS) is a research body providing the bulk of basic research in Slovakia. The SAS had a budget total €89.29m (of which €60.08m institutional grant from the Slovak Government) and employed 3211 people in full-time equivalent (1812 of which held a scientific degree and 419 were PhD students, the rest of employees are technical staff) in 2013 (source: The 2013 Annual Report of the SAS). The institutional budget of the SAS was set at €59.71m in 2014 and €58.52m in 2015 (source: 2014 and 2015 State Budget Laws).
- Higher Education Institutions. There were 23 public and 13 private higher education institutions in Slovakia (as of 2014). Public support to HEIs was €460.6m in 2013. The estimated support for 2014 was €457.2m. The 2015 support was set to €453.1m². Share of public expenditure on the university system in GDP was 0.64% in 2013. Shares estimated for 2014 and 2015 were 0.62% and 0.59% respectively³.

The key funding agencies include:

- The VEGA is the funding grant agency for the MESRS, and the SAS. The VEGA allocated €13.77m to 2054 research grants in 2014 (source: the VEGA webpage).
- The Slovak Research and Development Agency (SRDA) mostly provides applied research grants for public and private bodies. The SRDA budget increased from €0.15m in 2001 to €26.27m in 2014. The 2015 SRDA budget is set to €26.16m.

Most research was performed in the business sector (46.3% of total expenditure in R&D), public research facilities (20.5%) and higher education institutions (33.1%) in 2013. The private non-profit sector accounted for less than 0.1% of total outlays in the same year.

Information on the composition of the private sector research community is scarce. Few important companies publish data on their R&D spending⁴. The 2006-2014 EU Industrial R&D Investment Scoreboards included no Slovak company.

Policy mix relies on means from the OPRD and OPCEG. The mix supports policy measures aimed at infrastructure building, creating linkages between the academia and industry sectors, technology transfers, and venture capital schemes. The most recent innovation policies indicate a positive shift towards more sophisticated innovation policies in the near future in terms of new agendas (support to clusters), target groups (MNCs), and modes of funding (innovation vouchers, tax reliefs).

² Source: The 2015 State Budget Law of 4 December 2014.

³ Estimates of the GDP volumes provided by the AMECO macroeconomic database (European Commission, Economic and Financial Affairs). Source for budget data: Slovak Ministry of Finance (2014) Proposal for the 2015-2017 Budget of Public Administration.

⁴ No Slovak company has been included in the EU Industrial R&D Investment Scoreboard since 2005. Annual Accounts of several Slovak companies provide limited data on R&D in 2013: (Continental Matador Rubber (automotive parts): €21.452m (2011: €17.587); US Steel: €3.1m (2012: €3.2m). Slovak Power: €2.5m (2012: €2.0m). ESET s.r.o (producer of software security products) has been the most innovative and R&D intensive firm in Slovakia since the late 1990s. It had a turnover of €300m, profits of €75.2m, some 922 employees and its own R&D centres in Bratislava (Slovakia), San Diego (USA), Buenos Aires (Argentina), Moscow (Russia), Montreal (Canada), Krakow (Poland) and Singapore in 2013. The firm, unfortunately, refused to provide data on R&D spending.

Main changes in 2014

The Slovak Government approved the Operational Programme Research and Innovation (OPRI) via Resolution no 230/2014 on 14.05.2014. The OPRI contains five Priority Axes with significant allocations during the period 2014-2020. In total the OPRI allocates €3988.00m, of which €2226.78m from EU resources, €272.40m from national public resources, and €1468.84m from national private resources. The OPRI is the major source of finance for the Slovak R&D system in period 2014-2020.

Main Changes in 2013

The SGCSTI met for the first time on 9 April 2013 to discuss the first draft of the Smart Specialisation Strategy (RIS3 document).

The final version of the RIS3 document was passed via Government Resolution no. 665/2013 on 13 November 2013. The Smart Specialisation Strategy is the first policy document integrating research and innovation policies in Slovakia.

Main changes in 2012

The Ministry of Economy drafted an amendment of the 181/2011 Law on Subsidies as to include innovation, research and development in the list of supported activities. The Slovak Government approved the draft via its resolution No. 643/2012 of 28.11.2012 and earmarked some €300,000 for support to innovation and R&D.

Main changes in 2011

The Minerva 2.0 policy document (update of the 2005 National Lisbon Strategy, also known as the Minerva 1.0 strategy) was passed via Government Resolution No. 544/2011 of 17 August 2011.

The Slovak Government Council for Science, Technology and Innovations (SGCSTI) was established by Government Resolution No. 620/2011 on 28 September 2011. The SGCSTI is the top governance body for research and innovations in Slovakia.

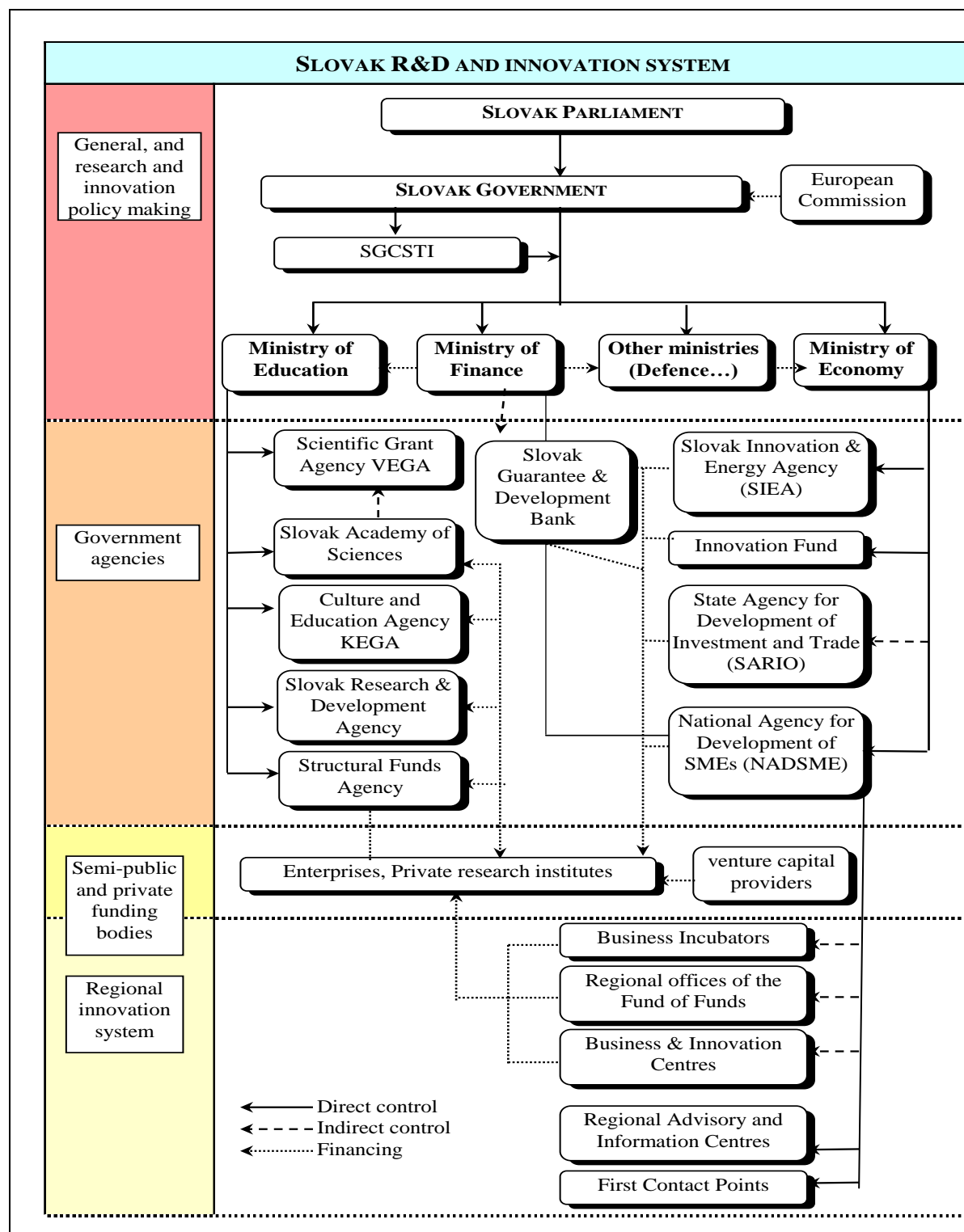
The Slovak Government passed the 2011 Innovation Policy document via Government Resolution No 302/2011 of 11th May 2011.

The Fenix Strategy: Update of the Long-Term Objective of the State Science and Technology Policy up to 2015 was passed via Government Resolution No. 467/2011 on 06.07.2011. The main goal of the Fenix Strategy is 'preparing an amendment to the 172/2005 Law on the organisation of state support for research and development', and defining priorities, targets and forms of public support for R&D.

Main Changes in 2010

The New Model for Financing Science and Technology in the Slovak Republic was passed via Government Resolution No. 313/2010 on 12.05.2010. It set out the principles for research funding in Slovakia, including thematic priorities, the balance between institutional and project finance, and basic and applied research

Figure 1. Slovakia's RDI governance system



2. Recent Developments in Research and Innovation Policy and systems

2.1 National economic and political context

The Slovak economy avoided recession and grew by a low rate of 2.4% in 2014. The estimated growth rate is 2.9% for 2015. The low growth disabled job creation and affected government finance. The unemployment rate reached 13.4% in 2014. The 2015 unemployment rate is estimated at 12.9% in 2015. The budget deficit was 2.8% GDP in 2013 and 2.9% GDP in 2014. The deficit should drop to 2.5% in 2015. Gross government debt as percentage of GDP was 53.6% in 2014 and should go up to 54.9% in 2015 (source: European Commission, The European Economic Forecast, Winter 2015). The Fiscal Responsibility Act (FRA, constitutional law) sets out 3% cuts in all public expenditure once the debt/GDP ratio exceeds 55%. The same law sets out that the Government must adopt a balanced budget should the debt/GDP ratio reach 57%.

The Slovak Government acknowledged the threat of fiscal freeze, but at the same time, it decided to implement some 15 pro-growth and pro-social policies in 2015⁵. The Ministry of Finance argued that extra expenditure would be matched by better tax collection and structural reforms in the public sector, including higher education and the Slovak Academy of Sciences (SAS). The Ministry of Finance presented a draft Budget Law for 2015-2017 and suggested cutting the SAS budget by 16% from €59.71m in 2014 to €50.52m in 2015. The SAS employees went on strike. After intensive negotiations with the Ministry of Finance the 2015 institutional budget of the SAS was set at €58.52m in the 2015 State Budget Law. The Ministry of the Interior (managing body for public sector reform) also insisted on merging 64 institutes and service organisations into 9 larger units. The SAS also suggested that its internal structure should be set by the law on the SAS transformation (currently under preparation) and not by the Ministry of the Interior. The final structure of the SAS should be set by September 2015.

2.2 National R&I strategies and policies

R Current research policy goals are set out in the national [Smart Specialisation Strategy](#) (RIS3 document). The RIS3 document is the national R&I strategy for 2014-2020. It sets goals and policy measures aimed at research, innovation and education:

- Goal 1 tackles the challenge of the dual economy and aims at increasing the embeddedness of key industries in Slovakia. The RIS3 document proposes policy measures aimed at (i) increasing embeddedness by multinational companies (MNCs) in Slovakia's economy; (ii) improving the integration of Slovak firms into the global value chains; and (iii) support to clusters and joint research centres by public and private sectors.
- Goal 2 relates to support for economic growth via the results of excellent science⁶. Measure 2.1 'Strengthening excellence research' aims to 'improve international co-

⁵ The pro-growth and pro-social policies include the X-mas pension bonus (€81m), free trains for students and pensioners (€13m) and decrease in health insurance payments for some 800,000 low-income earners (€172m). General elections will be held in 2016.

⁶ The RIS3 document mentions excellence science. Frontier science is not addressed.

operation and excellence' and 'integrate Slovak science into the European Research Area'. Measure 2.2 'Developing excellence research and research infrastructure' envisages grants supporting ESFRI infrastructure projects. The Measure 2.4 'Systemic support to and stimulation of international co-operation in science and technology' aims at improving Slovak participation in the Horizon 2020, ERC and ERANET programmes, joint programming, and cross-border co-operation.

- Goal 3 'Creating a dynamic, open and inclusive innovative society as a condition for improving quality of life' contains three policy measures on grand societal challenges. Indicative set of the grand societal challenges Slovakia wants to solve by means of co-operation within the ERA includes population ageing, youth unemployment, inclusive society, and environmental issues.
- Goal 4 'Improving the quality of human resources for an innovative Slovakia' contains policy measures aimed at improving system of vocational education and supporting excellent higher education.

The RIS3 document is a multi-annual plan, but it does not provide for a predictable budgetary framework. National support for science and technology is determined by the Ministry of Finance and presented in the three-year Proposal for the Budget of Public Administration. The annual support is usually subject to fierce bargaining between the Ministry of Finance on one hand and key stakeholders (Universities and the Slovak Academy of Science) on the other hand. The RIS3 document presents plans for (i) changing shares of support for basic and applied research from the current ratio of 2:1 to 1:2 by 2020; and (ii) introducing a 'mandatory indicator of the state support for R&D as a percentage of GDP in the State Budget Law'. The proposed 2015-2017 Budget of Public Administration contains no actions supporting these plans and foresees decreases in national public support for research and innovation.

The Ministry of Education, Science, Research and Sports (MESRS) drafted the Action Plan for the RIS3 document. The Action Plan concentrated on legislative measures aimed at the reform of funding agencies, the transformation of the SAS and the introduction of tax credit for business R&D. These measures should stimulate business R&D expenditure and applied research. The Action Plan also suggested a set of criteria for allocating financial support to seven thematic priorities:

- a) material research and nano-technologies;
- b) information and communication technologies;
- c) biomedicine and biotechnologies;
- d) industrial technologies;
- e) sustainable energy;
- f) agriculture and environment;
- g) societal problems and challenges.

The allocation criteria include (i) economic importance; (ii) critical mass in terms of numbers of researchers; (iii) publication activity; (iv) citations and (v) participation in the FP7 projects. The draft of the Action Plan did not include the ESFRI roadmap. The new (2015) draft of the Action Plan went through the consultation process and the MESRS and other partners tried to incorporate the objections and proposals submitted during the process.

Most policy goals and policy measures of the RIS3 document will be implemented via the Operational Programme Research and Innovation (OPRI). The Slovak Government approved the OPRI via Resolution no 230/2014 on 14.05.2014. The OPRI contains five Priority Axes with significant allocations in the period 2014-2020:

- 1) Support for research, development and innovations (€2945.84m);
- 2) Support for research, development and innovations in the Bratislava Region (€299.67m);
- 3) Strengthening competitiveness and growth by small and medium enterprises (€592.53m);
- 4) Strengthening competitiveness and growth by small and medium enterprises in the Bratislava Region (€49.99m);
- 5) Technical assistance (€60.0m).

In total the OPRI allocates €3988.00m, of which €2226.78m from EU resources, €272.40m from national public resources, and €1468.84m from national private resources.

As a matter of fact, the Slovak Republic had no major national research programme in 2014. In 2002 the Slovak Government approved 6 horizontal and 3 thematic State Research and Development Programmes (SRDP). Seven SRDP concluded by 2007 and the last three by 2010. Total state support amounted to €91.36m in the period 2002-2010. The Slovak Government pointed to the availability of European financial resources and has launched no SRDP since 2010. The European resources were invested via the Operational Programme Competitiveness and Economic Growth (OPCEG) and the Operational Programme Research & Development (OPRD) in 2007-2013/15⁷. The OPCEG and OPRD lack clear thematic priorities. The OPCEG projects support innovations and technology transfers. The majority of the OPRD means was invested in building research infrastructures (see Table 1b in chapter 2.5.3).

Slovak research funding tended to be quite generic. Combined shares of the 'general advancement of knowledge: R&D financed from general University funds (GUF)' and 'other sources than GUF' in total GBAORD were 64.1% in 2012. In 2013 the share of generic funding increased to 69.0%. The three most important themes (industrial production, agriculture and health) accounted for some 31.5% of the total GBAORD (by NABS 2007 socio-economic objectives) in 2006. By 2013 the three most important themes (industrial production, health care and agriculture) accounted for some 16.2% of the total GBAORD. Societal priorities may be funded via the OPRI since 2015.

The RIS3 document noted a lack of thematic and sectorial focus, and indicated prospective sectors of economic specialization and related research themes. The RIS3 document identifies four key areas of economic specialisation: (1) automotive and mechanical engineering industries; (2) consumer electronics and electrical equipment; (3) information and communication technologies and services, and (4) production and processing of iron and steel. The document also lists 'prospective areas of specialisation', such as (a)

⁷ Slovakia was unable to spend the Structural Fund assistance by 2013. The Slovak Government negotiated with the European Commission and won an exception on spending the Structural Fund means by the end of 2015. There nevertheless were concerns that Slovakia would not be able to spend some €1-1.5b of total Structural Fund resources (€13.6b) by end 2015. The total amount of certified spending was €8.3b (61.1%) by 31.10.2014. Source: National Strategic Reference Framework: [Spending by the Structural Funds](#).

automation, robotics and digital technology; (b) processing and increasing the value of light metals and their alloys; (c) production and processing of plastics; (d) creative industry, and (e) increasing the value of domestic raw material base.

2.3 National Reform Programmes 2013 and 2014

The [2013 National Reform Programme](#) (NRP) for the Slovak Republic noted that 'insufficient funding, fragmentation of expertise and management system, and unstable support for science and research' were major problems for developing an efficient system of research and innovation. The proposal for the 2015-2017 Budget of Public Administration, however, envisaged cuts in national funding for science and technology. The Slovak Government also intended to concentrate state support for R&D on selected priority areas, where Slovakia has a comparative advantage, such as material research and/or information and communication technologies. It wants to establish an 'effective system of national financial and administrative support structures for Horizon 2020', reduce administrative burdens for the Structural Fund schemes, and set up a 'complementary system for the funding of projects from the state budget and EU framework programmes'. Major goals for innovation development are set out in the national RIS3 document. Business and innovation incubators, technology transfer schemes, innovation vouchers and financial engineering schemes (JEREMIE) are the main tools for innovation policies.

The [2014 National Reform Programme](#) for the Slovak Republic repeated some intention from the 2013 NRP, but was rather vague in terms of specific goals and policy actions. The 2014 NPR, for example, confirmed the government's intention on the 'cancellation of scientific-pedagogic and artistic-pedagogic titles of assistant professor and professor, while retaining only the relevant functional positions'. This should 'make the academic career more flexible and the system open also for persons interested from abroad or from practice'. No specific policy actions toward these targets were taken⁸.

The RIS3 document presented plans for merging eight government R&D agencies into two. The merger would enable the higher flexibility and complementarity of research support schemes. The 2014 NRP confirmed the government's commitment to reform public research organisations, but no respective laws were drafted by the end of 2014⁹. The government also stated its support for the 'involvement of Slovak organizations in European networks and programmes such as the Horizon 2020, Danube Strategy, ECSEL, EIT, ESFRI'. A new professional office of national points for the involvement of Slovak participants in the Horizon 2020, and the Liaison Office of SR for R&D in Brussels were established in January and February 2014¹⁰. As for the support for innovation the 2014 NRP pointed to the ongoing JEREMIE programme. The 2014 NRP also mentions 'innovative forms of financing' and 'clustering and other forms of networking at the local, regional,

⁸ The annex of the 2014 NPR contains lists of legislation to draft by end of 2013 and early 2014. Most of the legislation was not ready by the end of 2014.

⁹ The Slovak research community expressed diverse opinions in the Slovak media about the plans to reform the research funders and performers. Some researchers feared a loss of academic freedom and thought that the new (more centralised) system would give too much power to government officials over the direction of research funding.

¹⁰ The Liaison Office aims at "monitoring European policies and R&D policy instruments with special regard to the Horizon 2020". The office also aims at improving the cooperation with the European institutions, supporting the search of partners for Slovak R&D bodies and promoting the Slovak research and development (source: Liaison Office website: www.slord.sk).

national and macro-regional level', but gives no details on policy actions to be implemented.

2.4 Policy developments related to Council Country Specific Recommendations

The [2014 Country-specific Recommendations](#) for the Slovak Republic include actions to be taken on 'improving the quality and relevance of the science base and implementing plans to foster effective knowledge transfer and co-operation between academia, research and business'. These recommendations are addressed in the RIS3 documents and the Operational Programme Research and Innovation (see chapter 2.2). The Annex of the 2014 National Reform Programme contains lists of policy initiatives in the reform of science and technology. The most important actions include (i) support for building technology transfer centres; and (ii) amendments to the 172/2005 Law on the Organisation of State Support for Science and Technology and the 185/2009 Law on R&D Stimuli. The amendments aim at 'changing the system of grant support for R&D in order to increase project quality and increase the motivation for the public sector to co-operate with the private sector'.

2.5 Funding trends

The 2020 national targets for shares of GERD and BERD in GDP (set by the [2013 National Reform Programme](#)) are 1.2% and 0.8% respectively. The GERD target may be realistic provided that the EU assistance to Slovak research system continues. The BERD target is more challenging, because of extremely low R&D spending by Slovak firms.

Major long-term trends in research funding in Slovakia included (a) a decline in research funded by the private sector and an increase in the relative importance of government finance, (b) a decrease in the importance of applied research and an increasing importance of basic research, (c) a decrease in shares of engineering and increasing shares in natural sciences (related to basic research), and (d) disappearing thematic focus with an increase in non-oriented research and general University funds (Figure 2). These trends relate to an overall fall in research spending, and a decline in the domestic private research base in the 1990s in particular. The share of GERD in GDP was 3.88% by 1989, but 0.83% in 2013 (Table 1, source: Eurostat). The number of researchers was declining simultaneously with the GERD shares in GDP (Figure 2).

2.5.1 Funding flows

Table 1: Basic indicators for R&D investments

	2009	2010	2011	2012	2013	EU28 (2013)
GDP growth rate	1.60%	3.90%	4.50%	2.00%	1.60%	0.10%
GERD (% of GDP)	0.67%	0.72%	0.75%	0.89%	0.87%	2.02%
GERD (euro per capita)	55.0	68.3	73.6	89.0	89.2	539.2
GBAORD - Total R&D appropriations (€ million)	1,051.67	1,313.59	1,175.14	1,370.13	1,438.38	90,505.61
R&D funded by Business Enterprise Sector (% of GDP)	0.18%	0.18%	0.21%	0.29%	0.32%	1.1% (2012)
R&D funded by Private non-profit (% of GDP)	0%	0%	0%	0%	0%	0.03% (2012)
R&D funded from abroad (% of GDP)	0.04%	0.09%	0.1%	0.12%	0.11%	0.2% (2012)
R&D related FDI (*) (€ million)	300.79	303.53	388.22	525.14	694.17	n/a
R&D performed by HEIs (% of GERD)	37.07%	37.19%	35.10%	34.43%	29.26%	23.19%
R&D performed by Government Sector (% of GERD)	34.31%	35.90%	34.53%	27.96%	26.83%	12.21%
R&D performed by Business Enterprise Sector (% of GERD)	28.50%	26.63%	30.13%	37.21%	43.62%	63.76%
Share of project vs. institutional public funding for R&D	44.63% / 45.98%	48.36% / 33.54%	57.55% / 31.81%	63.61% / 32.94%	64.46% / 30.33%	n/a
Employment in high- and medium-high-technology manufacturing sectors as share of total employment	4.8%	4.6%	4.8%	4.9%	5.0%	5.6%
Employment in knowledge-intensive service sectors as share of total employment	29.5%	30.1%	30.0%	30.6%	31.2%	39.2%
Turnover from innovation as % of total turnover	9.8% (2008)	8.0%	n/a	n/a	n/a	13.4% (2010)

Data sources: EUROSTAT, October 2014; the Ministry of Science and Higher Education; GUS; (*) data for R&D expenditures of business enterprises with predominance of foreign capital (GUS).

The Slovak research system relies more and more on European resources. Support for a knowledge-based economy accounts for an impressive increase in the period 2007-2013/15 (source: Slovak Government: the National Reference Framework for the Slovak Republic for period 2007-2013). The total assistance by Structural Funds to human resources, R&D and innovation was some €436m in the period 2004-2006 and increased to €5b in the period 2007-2013/15. The European assistance, however, outnumbered national funding. This trend has been evident since the outbreak of the economic crisis in 2008. The Slovak Government pointed to the availability of the European resources for R&D funding and cut national support to research and development.

In 2013 the total public support for R&D was €415.61m, of which Operational Programme Research and Development (OPRD) provided €118.92m (including national co-financing). The salaries of all public HEI teachers (€192.34m) were classified as 'R&D expenditure' and accounted for the most important expenditure item. The 2014 total public support for

research and development was set at €574.87m, of which HEIs salaries were €192.31m and the OPRD resources €270.94m (Table 1a). The OPRD therefore provided 71% of total national support for R&D (except for the HEIs salaries, which are funded from national resources). The 2015 State Budget proposal set the total support to €358.45m, of which HEIs salaries €189.88m and the OPRD resources €108.49m. A decrease in spending by the OPRD is a major factor behind the total decrease in public R&D spending expected in 2015.

The austerity measures also affected national R&D funding. The budget of the Slovak Research and Development Agency (most important R&D funder in Slovakia) dropped from €27.97m in 2013 to €26.27m in 2014¹¹. The 2015 State Budget Law set the budget of SRDA to €26.286m in 2015.

The usual co-financing rate by the ERDF/ESF (for measures provided under the OPRD) is 85%-95%. Innovation policy measures almost completely rely on assistance provided by the Operational Programme Competitiveness and Economic Growth. The usual co-financing rate by the ERDF/ESF is 50-85%.

Table 1a: Public support to R&D in Slovakia in 2012-2017 (€m)

	2012	2013	2014e	2015f	2016f	2017f
Total public support	379.07	415.61	574.87	358.45	340.86	360.93
MESRS (a) – (d), of which	191.96	192.34	192.31	189.88	189.68	189.68
(a) HEIs salaries	142.34	142.85	143.86	140.96	140.96	140.96
(b) SRDA	22.16	25.96	24.96	24.96	24.96	24.96
(c) fees in international organisations	7.15	8.14	9.10	9.10	9.10	9.10
(d) other ¹⁾	20.31	15.40	14.39	14.86	14.66	14.66
OPRD, including national co-financing	101.12	118.92	270.94	108.49	91.70	112.00
Slovak Academy of Sciences ²⁾	71.70	85.57	97.85	47.02	47.02	47.02
Other central government	14.29	18.78	13.76	13.06	12.46	12.24

Source: Ministry of Finance 2014: Proposal for the 2015-2017 Budget of Public Administration.

Notes: e = expected value; f = budget forecast. 1) includes running costs of the SRDA and the Centre for Science and Technology Information, and horizontal R&D measure. 2) includes European resources. OPRD = Operational Programme Research and Development.

Research and innovation policies traditionally were considered matters of central government in Slovakia. Slovak regions have no legislative power in the field of research and innovation. No explicit regional R&I programmes and/or policy measures have been developed in Slovakia. All R&I policy measures are designed and implemented by the Slovak Government or its agencies.

Public-private partnership has had so far a rather limited role in leveraging additional funding. The State Budget supported six horizontal and three thematic State Research and Development Programmes (SRDPs) in the period between 2003 and 2010. The SRDPs should (among other goals) promote co-operation between the private and public sectors in research and development. the total support by the state budget was €91.36m and the

¹¹ The sum involves grant financing of €24.96m and the SRDA's operating costs of €1.12m. Sources: the 2013 and 2014 State Budget Laws.

private sector provided €20.94m in the abovementioned period. No SRDP has been launched since 2010¹².

The inter-regional funding has a marginal role in research and innovation in Slovakia. The Operational Programme INTERREG IVC has supported 23 Slovak firms since 2008.

The share of foreign funding in the total funding increased from 2.3% in 2000 to 18.0% in 2013. The European Commission and other international organisations generated the bulk of the foreign funding in Slovakia in 2013 (source: Eurostat).

Slovak public and private institutions accounted for 487 participations in 389 FP7 projects and obtained an EC financial contribution of €78.6m. Most EU Member Countries of comparative size were far more successful than Slovakia (Ireland: €634.4m; Greece: €1012.3m; Finland: €887.4m; Denmark: €1084.6m; Portugal: €526.1m; Czech Republic: €289.3m; Hungary: €293.7m; Slovenia: €171.8m).

¹² Sources: the 2013-2015 State Budget Laws.

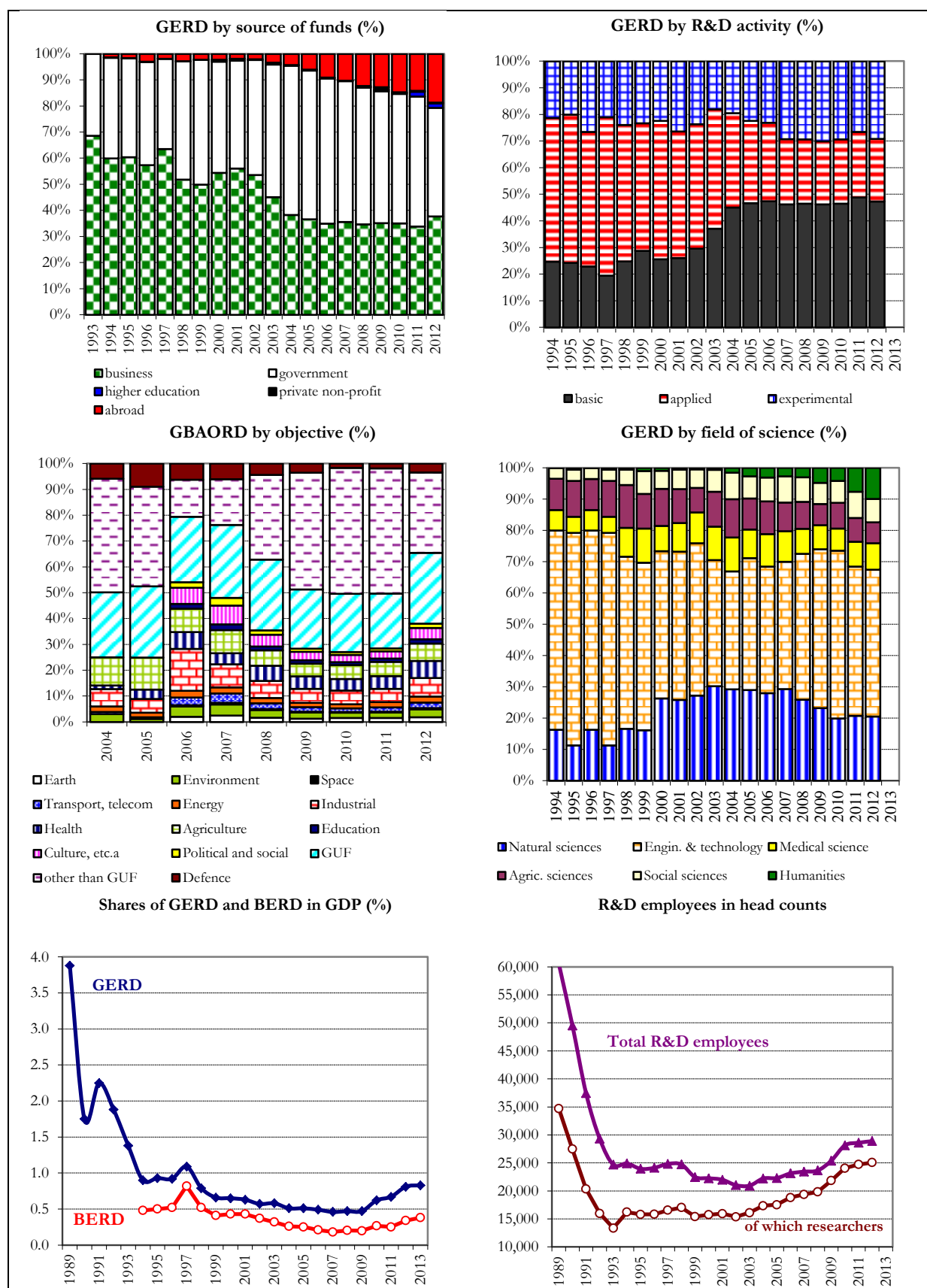


Figure 2: RTDI trends in Slovakia (Sources: Eurostat and the Statistical Office of the Slovak Republic).

2.5.2 Project vs. institutional allocation of public funding¹³

Slovak research funding relies almost exclusively on national, ESF and ERDF grants. In 2009, R&D tax stimuli were used for the first time, though to a limited extent. Institutional finance was mostly supported from national resources. Project funding mostly relied on Structural Funds. Financial support to institutional and project funding is set by the Ministry of Finance and approved by the Slovak Parliament in the State Budget Law. The Ministry of Finance also publishes three-year proposals for the budget of public administration, including public organisations for science and technology.

Institutional funding

Institutional funding supports basic research in HEIs and is provided directly (via block grants) from the state budget divisions (ministries and other central authorities). The total volume of institutional funding from the state budget was €39.43m in 2010, €106.42m in 2011, €142.34m in 2012 and €142.85m in 2013. The leap in funding between 2010 and 2011/12 is a statistical artefact and refers to a change in accounting rules. Most personnel costs on HEI were reshuffled to the chapter on research.

The Slovak Republic uses two types of institutional funding: (1) block funding and (2) competitive institutional funding.

(1) Block funding is provided to the Slovak Academy of Sciences (SAS) and public higher education institutions (HEIs). The SAS has a single block grant determined by the State Budget Law. The total block grant for the public HEIs is also determined by the State Budget Law, but grants for particular HEIs are distributed via the Slovak Ministry of Education, Science, Research and Sports (MESRS). The MESRS uses complex formulas for allocating institutional support to 23 public HEIs (2014: €430.86m)¹⁴. Different formulas are applied to wage and infrastructure development. The 2014 formula for wages in HEIs (€181.54m), for example, gives an 85% weight to the number of students and a 15% weight to research/arts¹⁵ output by particular HEIs. Annual block funding includes four major components:

- a) support for teaching (€242.05m);
- b) support for R&D and art activities (€143.13m);
- c) support for the development of HEI (€2.29m);
- d) support for students from low-income families (€54.85m).

Support for R&D and art activities comes in six forms:

(i-ii) VEGA and KEGA grants (see next indent);

¹³ Please use the following definition: "Institutional funding is defined as the total of national budgets in a given country, attributed to an institution, with no direct selection of R&D project or programmes and for which money the organisation has more or less freedom to define the research activities to be performed." Institutional funding can be in the form of non-competitively allocated Block funding. Institutional funding may also be allocated in a variable/competitive manner tied to institutional assessments. "Project funding is defined as the total of national budgets in a given country, attributed to a group or an individual to perform an R&D activity limited in scope, budget and time, normally on the basis of the submission of a project proposal describing the research activities to be done". Steen, J. v. (2012), "Modes of Public Funding of Research and Development: Towards Internationally Comparable Indicators", *OECD Science, Technology and Industry Working Papers*, 2012/04, OECD Publishing. <http://dx.doi.org/10.1787/5k98ssns1qzs-en>.

¹⁴ For the 28-page manual for HEIs finance please see: MESRS (2014): [Metodika rozpisu dotácií zo štátneho rozpočtu na rok 2014 pre verejné vysoké školy](#) (Methodology for the state budget grants for public higher education institutions in 2014).

¹⁵ Arts outputs are considered for the HEIs specialized in music, drama and arts.

- (iii) support to HEIs infrastructure;
- (iv) grants for PhD students;
- (v) reserve for non-planned research;
- (vi) reserve for wage increase.

The 2014 formula for HEIs infrastructure¹⁶ (€118.5m) gives a 43% weight to the R&D quality of a HEI (as established by the last accreditation), a 22.5% weight to the share of a HEI in the national research/arts output, a 10% weight to the share of a HEI in the national number of PhD students, a 10% weight to the share of a HEI in domestic grants, a 10% weight to the share of a HEI in foreign grants and the rest is determined by other factors.

Some central government ministries run their own applied research institutes and units. The total support for these institutes was set at €13.76m in 2014 (Table 1a).

- (2) Competitive institutional funding from national resources is provided via the Vedecká grantová agentúra (VEGA) and Kultúrna a edukačná grantová agentúra (KEGA) grants. The VEGA and KEGA grants help to pay for the overhead costs of research institutions. The HEIs part of the VEGA funded 1401 projects (€9.40m) and the SAS part of the VEGA 653 projects (€4.37m) in 2014. The KEGA funded 451 projects in Slovak HEIs (€2.50m) in 2014. Competitive institutional funding supports the running costs of public institutions and excludes salaries and/or capital expenditure. The VEGA and KEGA grants, however, are based on competition and are considered project finance in Slovakia.

Project funding from national resources is also provided via the Slovak Research and Development Agency (SRDA) grants.

Project funding

Project funding is provided through national and European resources. The total volume of public support for project finance accounted for €253.73m in 2011¹⁷. It increased by 7.5 times during the period 2007-2011. The increase is related to the financing of programmes through Structural Funds. See chapter 2.5.3 for more details.

The share of the national project funding (VEGA, KEGA, SRDA and other central government grants) in the total national funding (projects versus block grants) was 21.3% in 2012 (source: Eurostat – Total GBAORD by funding mode)¹⁸. Main expenditure items (block grants to HEIs and SAS, SRDA budget) did not change much over the period 2012-2014.

¹⁶ The 'HEIs infrastructure' in fact is HEIs teacher salaries.

¹⁷ The latest available data from the 2011 Annual Report on R&D.

The 2012 and 2013 Annual Reports on R&D did not include a comprehensive review of project finance in Slovakia.

¹⁸ The Eurostat and the Slovak Ministry of Finance report different figures for the GBAORD. The Eurostat data for GBAORD are €294.7m for 2012 and €266.0m for 2013. The Slovak Ministry of Finance reports €243.3m and €237.6m respectively. The Eurostat states total project funding €62.27m in 2012 in Slovakia. The Slovak Ministry of Finance, and Ministry of Education, Science, Research and Sports report (i) €23.0m for the RDA projects; (ii) €13.3m for the VEGA projects; (iii) €2.5m for the KEGA projects, (iv) €7.5m for R&D stimuli and (v) €10.9 for the international co-operation in S&T (including membership fees). Items (i) – (v) total to €57.2m. The difference between the Eurostat value of €62.27m and items (i) – (v) (€57.2m) may refer to R&D projects developed by the sectoral ministries, on which there is little information. Budgets for items (i) – (v) changed little in 2012-2014.

Prior to 2011, the SAS and the HEIs could benefit from other allocation mechanisms, such as the State R&D programmes and State Research and Development Orders (contract research for governmental organisations). This mode of funding is no longer available.

All competitive funding is subject to peer review in Slovakia. The VEGA, KEGA and the Slovak Research and Development Agency (SRDA) grants usually disburse a few thousand euros per project, but are reviewed by domestic and foreign peers. One peer is a member of the SRDA advisory panel for a particular field of science, one a domestic expert and one a foreign researcher. The Structural Fund projects allocate hundreds of millions of euros (sometimes €10-20m per project, see Table 1b in chapter 2.5.3), but are evaluated by domestic evaluators only.

The major challenges relevant for the efficient and effective functioning of the funding allocation system include (a) the lack of a stable and predictable budgetary framework for R&D; (b) an underdeveloped evaluation culture, and (c) no clear relation between the results of evaluations and the amount of funding.

2.5.3 R&I funding

Government policies supporting innovation development are set out in the 2007 Innovation Strategy for the period 2007-2013/15. The Strategy heavily relies on European resources (Table 1b). Four operational programmes allocate about €1.7b to projects supporting innovation in the private and public sectors¹⁹.

- Projects from the *Operational Programme Information of Society* (OPIS, policy measures 1.1 and 1.2) allocate €770.4m to e-government projects at central and local levels. Digitalisation projects (policy measure 2.1) receive €172.4m and the development of broadband networks (policy measure 3.1) €13.2m. The implementation of most OPIS projects was significantly behind schedule by the end of 2014 (Table 1a).
- The *Operational Programme Competitiveness and Economic Growth* (OPCEG) allocates €488.2m to innovation and technology transfers and €106.3m to applied research projects (policy measures 1.1 and 1.3). Technology transfers were by far the most popular projects among Slovak enterprises. The total demand was three times higher than the indicative budget.
- The *Operational Programme Bratislava Region* (OPBR) mirrored the OPIS and OPCEG policy measures in the Bratislava Region, but with a considerably lower budget (Bratislava did not qualify for assistance under Objective 1).
- The *Operational Programme Research and Development* (OPRD) allocated €29.5m to the JEREMIE initiative. It also funded large-scale infrastructure projects (measures 1.1 and 3.1) and hundreds of applied research projects (measures 2.1, 2.2, 4.1 and 4.2).

The OPIS projects were implemented by the Office of the Slovak Government. The Slovak Innovation and Energy Agency (directed by the Ministry of Economy) implemented the OPCEG projects. The Structural Fund Agency of the Ministry of Education, Science, Research

¹⁹ Detailed information on all the Operational Programmes (programme documents, monitoring reports, and monthly information on spending rates) can be found on the webpage of the National Strategic Reference Framework: www.nsrr.sk.

and Sports implemented the OPRD projects. The OPBR projects were implemented by the Ministry of Agriculture and Rural Development.

All projects (except for JEREMIE) were implemented via grants. The OPCEG projects were designed for enterprises (some calls specified SMEs only), while the central and local public administration was recipient of the OPIS projects. JEREMIE initiative offered guarantees for SMEs²⁰. The HEIs and the Slovak Academy of Sciences generally were not eligible for the innovation-related OPIS, OPCEG and OPBR schemes. They, however, benefited from generous research infrastructure projects under the OPRD and Operational Programme Education.

The design and structure of policy measures aimed at innovation development were fairly similar in the planning periods 2004-2006 and 2007-2013.

Slovak national funding for innovation was negligible. The pilot cluster scheme received €0.2m and innovation voucher scheme €0.1m in 2013.

The monitoring and assessment of innovation-related projects supported from the Structural Funds coped with underdeveloped evaluation techniques. Monitoring reports for particular calls summarise only number of applicants and assistance demanded/awarded. Evaluation reports for operational programmes use to mention some specific problems in the implementation of policy measures, but provide no insights on the impacts of assistance in terms of increased competitiveness. The introduction of advanced impact assessment techniques is badly needed for the efficient allocation of European assistance in the planning period 2014-2020.

²⁰ The total allocation for the JEREMIE programme was €100.0m in the period 2011-2015. The JEREMIE launched three calls and provided €70.2m to four financial intermediaries in the period 2011-2013. The minimal allocations were not set in the calls. The maximal allocation to one SME was set to €1.5m. The JEREMIE programme is funded from three operational programmes ('Research and Development', 'Competitiveness and Economic Growth' and 'Bratislava Region'). There is no central data on the JEREMIE activities. The European Investment Fund (EIF) implements the JEREMIE programme in Slovakia via four financial intermediaries. Cumulative data on supported SMEs and industries are difficult to obtain. The EIF does not provide relevant statistics. The largest intermediary (Slovak Guarantee and Development Bank, SGDB) supported over 50 SMEs with €14m by the end of 2014 (source: interview with the SGDB manager for the JEREMIE scheme).

Table 1b: Structural Fund schemes supporting research and innovation projects in Slovakia, as of 31.12.2014

Operational programme	Policy measure	Total budget, €m	Projects submitted	Assistance required, €m	Contracted projects	Contracted assistance, €m	Certified eligible costs, €m	Certified costs as % of total budget
OPIS	1.1.	602.1	55	1,034.9	53	695.6	476.3	79.1
OPIS	1.2	168.3	48	162.5	41	104.1	44.9	26.7
OPIS	2.1	172.4	37	217.2	18	167.7	108.5	62.9
OPIS	3.1	13.2	1	13.2	1	13.2	0.2	1.4
OPRD	1.1	110.9	138	413.4	36	125.4	68.6	61.8
OPRD	2.1	155.5	139	339.5	67	158.5	138.9	89.4
OPRD	2.2	460.96	536	1166.6	189	591.1	209.1	45.4
OPRD	3.1	25.49	2	25.90	2	25.9	21.8	85.6
OPRD	4.1	74.34	102	270.1	40	94.1	66.4	89.3
OPRD	4.2	271.89	241	579.8	88	298.3	140.4	51.6
OPRD	5.1	285.3	102	452.8	75	306.0	227.7	82.3
OPCEG	1.1	488.2	2,951	1,482.4	1181	522.4	225.4	51.9
OPCEG	1.3	106.3	392	354.1	112	108.8	44.8	46.9
OPBR	2.1	28.1	305	45.3	153	26.0	25.8	91.9
OPBR	2.2	16.1	240	25.6	132	15.1	5.0	31.3

Source: Central Co-ordination Office of the Slovak Government: National Strategic Reference Framework; [Funds Allocation and List](#). Notes:

OPRD = Operational Programme Research & Development. Policy measures: 1.1 Reconstructing and building technical infrastructure of R&D; 2.1 Support for networks of centres of excellence; 2.2 Transfer of knowledge and technologies from R&D into practice; 3.1 Reconstructing and building technical infrastructure of R&D in the Bratislava Region; 4.1 Support to networks of centres of excellence in the Bratislava Region; 4.2 Transfer of knowledge and technologies from R&D into practice in the Bratislava Region; 5.1 Infrastructure of higher education institutions.

OPIS = Operational Programme Information of Society. Policy measures: 1.1 Electronisation of public administration and development of electronic services on the central level; 1.2 Electronisation of public administration and development of electronic services on the local and regional level; 2.1 Improvement of the system of acquisition, processing and protection of content from the resources of repository institutions; 3.1 Development of broadband access infrastructure.

OPCEG = Operational Programme Competitiveness and Economic Growth. Policy measures: 1.1 Innovation and technology transfers; 1.3 Support of innovation activities in enterprises.

OPBR = Operational Programme Bratislava Region. Policy measures: 2.1 Innovations and Technological Transfers; 2.2 Informatisation of Society

English titles of policy measures as stated in official documents. All budgets include the EU and national resources. Information on spending by the JEREMIE initiative (supported from the Operational Programme Research and Development) was not available.

The Slovak public R&D system almost exclusively relies on grants. All schemes supported from the Structural Funds also rely on grants, except for the JEREMIE programme.

The 185/2009 Act on R&D Stimuli introduced stimuli in the form of subsidies and tax reliefs. Some 21 companies were awarded stimuli of €18.42m in the period 2011-2013. A substantial majority of stimuli was provided via subsidies in the abovementioned period (87.9%). In July 2013 the Slovak Ministry of Education, Research and Sports (MESRS) published a new call for stimuli for applied research in 2014-2016. Private firms could apply for stimuli for their R&D projects in specified thematic areas (innovative drugs for lifestyle diseases, second generation of bio-fuels, communal waste processing, new motors for helicopters and high-tech machinery systems for car shells, and technologies for large

mono-crystals). The thematic areas of the stimuli correspond with the thematic priorities set out by the Danube Strategy. In 2013 six companies were awarded stimuli of €8.47m for the period 2014-2016²¹. Stimuli are subject to approval by the MESRS. The Slovak Parliament passed an amendment of the 595/2003 Law on Income Tax on 30.10.2014. The amendment (in force since 1 January 2015) introduced tax 'super deductions' for R&D performers²². Tax reliefs claims under the 595/2003 Law are mandatory (unlike stimuli provided under the 185/2009 Law). Once the company follows the tax law, it deducts the costs from its tax base automatically and there is no need to make a special application to the Ministry of Finance. The R&D performers can deduct from their tax bases 125% of all R&D costs plus up to 25% of labour costs in R&D in the current year²³. Moreover the R&D performers can deduct 25% of all R&D costs accrued in the previous year.

Five State Aid schemes provided grants, subsidies and tax relief to 174 companies (€34.42m) from national and European resources in 2013. Some 99.71% of the aid was provided via grants and subsidies, and 0.29% via tax relief (source: Ministry of Finance: [The 2013 State Aid Report](#)). Tax relief provided less than 0.1% of the total public national support for R&D in 2013.

2.6 Smart Specialisation (RIS3)

The Slovak Government passed the final version of the [RIS3 document](#) via Government Resolution no. 665/2013 on 13 November 2013. The 2.0 draft version contained detailed indicative financial allocations for particular policy measures. The government approved the final version of the RIS3 document with no financial allocations. Monitoring and evaluation arrangements are considered in chapter 8 of the RIS3 document. The chapter foresees 'regular reporting for the needs of the Slovak Government and the European Commission'. The Standing Committee of the Slovak Government Council for Science, Technology and Innovation (SGCSTI) is responsible for monitoring while the Analytical Department of the Government Office provides for the evaluation of 'measurable outputs, results and impacts of policy measures implemented under the RIS3'. Chapter 8 also assumes corrective actions 'in case the implementation of the RIS3 policy measures does not generate the expected results'.

The RIS3 document envisages policy measures aimed at increasing embeddedness and related variety of the key Slovak industries (linking Slovak SMEs with branches of the MNCs via clusters, innovation partnerships, joint research centres, applied research grants, etc.). The final goal of these measures is the integration of Slovak firms into global value chains and increasing levels of value added in products made in Slovakia. The clusters and innovation partnerships are considered for the abovementioned sectors of economic and technology specialisation.

²¹ Details on the mode of aid (subsidies versus tax relief) were not available.

²² All businesses claiming the R&D tax deduction must make their R&D projects public in advance on a special webpage of the Ministry of Finance. This regulation is intended to prevent abuse of tax super-deductions.

²³ The amendment contains many problematic provisions. The provisions significantly limit the actual amount of the deductible costs for business applicants. Labour costs, for example, are deductible only for R&D employees younger than 26. The purchase of intangibles and services are excluded from super deduction. Business R&D performers applying for super-deduction must present their R&D projects to the Ministry of Finance and publish these projects in advance on the webpage of the Ministry. Less stringent requirements apply to public Universities and the Slovak Academy of Sciences.

Slovakia has no specific regional research policies. The degree of institutional autonomy by Slovak regions is quite low. Regional governments in the eight self-governing regions (SGR) (NUTS III level) were established as late as in 2002. The 302/2001 Law on Self-Governing Regions makes no references to competences in support to regional innovation and research systems. If a region wants to support research and innovation, the usual way is to include these items in 'support for regional planning and development'. Support for human resources (secondary education in particular) is the only important competence Slovak regions have in the field of innovation development.

Regional governments commissioned two generations of regional innovation strategies (RIS). The first generation of the RIS3 was drafted during the period 2004/2006 and applied until 2013/2014. In 2013-2014 regional governments used financial assistance from the Regional Operational Programme and commissioned second generation ('smart-type') RIS. The ['Strategy for Development of Regional Research and Innovation Base of the Bratislava Region in period 2014-2020'](#) was the only smart-type RIS document available by the end of 2014. The first and second generations of the RIS, however, contain no mandatory plans for the implementation of regional policy measures. Almost all measures supporting R&D and innovation are designed, implemented and evaluated by the central government agencies ([SIEA](#) and [ASFEU](#) in particular). The central government may consider targets and policy tools suggested by the regional innovation documents, but is not bound to adopt them. Regional innovation strategies, in fact, are more 'wish lists' than real planning documents in Slovakia.

2.7 Evaluations, consultations, foresight exercises

The Slovak Republic regularly uses monitoring and review mechanisms (based on output indicators and international benchmarking) to evaluate the performance of public research institutions, higher education institutions, and research programmes and projects. These mechanisms provide relatively accurate and comparable information about the quality (but not efficiency) of funding from public resources. The evaluation culture, however, is underdeveloped, in terms of funding efficiency and impacts in particular.

Systemic evaluations are elaborated by the Slovak Government and the Ministry of Education, Science, Research and Sports. Since 2006 the Slovak Government has published eight Annual Reports on R&D. The reports provide a concise summary of the state financial support for R&D activities and identify the strengths/weaknesses of the Slovak R&D system. The Annual Reports on R&D contain a chapter on international benchmarking, but give little guidance on potential improvements in the research system. The report acknowledges that the 'while the Slovak economy grows rapidly, research, development and innovations lag behind the European average'. The same report identifies 'below average financial resources, an excessive focus on basic research, relative autarky and, so far, a low impact of research on the innovation performance of the Slovak economy' as the major problems of the Slovak R&D&I system. The annual reports on R&D and annual reports issued by the Slovak Research and Development Agency list numbers of projects and volume of assistance provided by the state budget, but do not mention impact evaluation.

Since 2009 the Slovak Government has published annual evaluation reports on the 2007 Innovation Strategy and the 2008 and 2011 Innovation Policy initiatives²⁴. The latest 2012 report acknowledges that the 'Slovak Government considered the negative impacts of the economic and financial crisis and concentrated financial resources mainly on support for job creation and subsidising existing employment'. Financial resources allocated to innovation were lower than those envisaged in the State Budget Law. As for the national financial support for innovation de minimis scheme supporting industry clusters was the most important initiative (€0.2m). The European resources should provide much higher investments via the JEREMIE programme (€125.0m) in 2013-2015. The 2012 evaluation report concluded that the 'sectorial structure of the Slovak economy should converge to that by the advanced EU economies', but 'enterprises must be more active in applied research and innovations'. Support to cluster policies may generate an environment conducive to the development of research and innovation.

The Structural Funds schemes are evaluated on a continuous and periodical basis. The monitoring reports (related to individual calls) and the annual reports for particular operational programmes tend to be rather formal. They concentrate on stating numbers of applicants, and the volume of support required and awarded. Impact assessment procedures are underdeveloped, because of a lack of experts and techniques. The preparation of the RIS3 document provided a unique opportunity for the complex evaluation of the Structural Fund schemes in period 2007-2013. Detailed data are contained in Annex 2 of the RIS3 document. Major lessons learnt are discussed in the chapter 2.3 of the document and relate to the key operational programmes ('Research and Development', 'Education', 'Competitiveness and Economic Growth' and 'Bratislava Region'). The evaluation report states many positive outcomes of the Structural Fund schemes, e.g. in terms of numbers of infrastructure and R&D co-operation projects, R&D Centres, Competence Centres patents, scientific jobs created, and papers published in reviewed journals. Implementation of the schemes was a subject to many difficulties. The RIS3 document explicitly mentions excessive bureaucracy, inappropriate timing and management procedures, inadequate funding rules, ambiguous settings of the procurement system, and problematic evaluation arrangements, which focused more on quantitative indicators than on quality assessment.

The main evaluation body for Universities is the Accreditation Commission of the Slovak Ministry of Education, Science, Research and Sports (MESRS). It evaluated 27 higher education institutions (HEIs) in 2009-2010. The Accreditation Commission classified HEIs in three categories: (i) Universities, (ii) Higher Education Institutions and (iii) Professional Higher Education Institutions. The MESRS deemed there are too many HEIs. It rejected proposals for establishing several new private HEIs in 2010, but it approved one in 2011 and one in 2012. The new round of accreditations started in 2014. The Accreditation Commission approved new, more stringent rules on 15 April 2013. The rules put more emphasis on research excellence in terms of scientific papers published/cited in journals listed in the international scientific databases (WOS, SCOPUS), research monographs published with high-quality publishers and international patents. The public system of higher education, unfortunately, is heavily underfunded and the results of the evaluation

²⁴ Five evaluation reports were approved by the Slovak Government and published on the Government Office webpage: the 2008 Evaluation Report (Government Resolution no. 810/2009 of 18 November 2009); the 2009 Evaluation Report (Government Resolution no. 212/2010 of 9 June 2010), the 2010 Evaluation Report (Government Resolution no. 51/2011 of 22 June 2011), the 2011 Evaluation Report (Government Resolution no. 455/2012 of 12 September 2012) and the 2012 Evaluation Report (Government Resolution no. 15911/2013 of 16 October 2013).

have little impact on improvements in the performance of the HEIs. In April 2104 the Accreditation Commission also launched a pilot project to identify the top research teams in Slovak HEIs. HEIs with excellent research teams should be allowed to ask for higher funding from public resources.

The Slovak Academy of Sciences (SAS) has been evaluating its institutes since 1992. The last round was concluded in 2012. The accreditation commission appointed nine panels of experts to evaluate particular institutes by scientific fields. About one third of the panel members were foreign experts. Top research teams in the SAS were also evaluated by the Academic Ranking and Rating Agency, an independent evaluator body. The evaluation generated no visible positive outcomes. The overall financial support to the SAS from the state budget did not change in nominal terms and decreased in real terms over the course of the last three years. Results of funding evaluations are not taken into account in improving the designs of funding programmes and research performers. The Ministry of Finance presented its plans to cut the SAS budget by 16% in 2015 with no regard for evaluation results. The overall 2014 wage budget for the SAS, for example, is fixed and must reflect worker entitlements related to qualification and length of service. The SAS may re-distribute only 5% of the total wage budget based on the accreditation result.

Establishing international evaluation standards is no easy task in Slovakia. The system of research and higher education is heavily underfunded and it is difficult to find good quality foreign evaluators. The grant agencies and accreditation commissions mostly engage experts from the Czech Republic (for reasons of language and cultural proximity) or Slovak citizens employed with foreign higher education and research institutions. The Slovak research and higher education system would no doubt benefit from the engagement of truly foreign and independent peers.

The National Audit Office (NAO 2013) assessed the efficiency of the FP7 resources in 19 faculties of selected higher education institutions in 2013. The audit found that Slovakia was able to 'obtain back 18 cents from the FP7 projects per each euro paid by the Slovak state budget to the FP7 budget'. Slovakia was an important net contributor to the FP7. The audit also found that the Ministry of Education, Science Research and Sports (MESRS) did not 'analyse the contribution of national and EU resources to the priorities of R&D policies in Slovakia. There was no model for assessing the efficiency of financial support for science, research and innovation'. The audit also found 'missing systemic support for project teams – from preparatory phases, via legal and financial support to IPR activities to marketing and popularisation of science'. There was 'lack of systemic tools for stabilising high-quality research staff and preventing a brain-drain'. The audit also noted that the Bratislava region concentrated 34% of HEIs in Slovakia, but was excluded from most support under the Structural Fund schemes and the MESRS did not take Bratislava's disadvantage into account when implementing national policies supporting R&D.

Slovakia had no macroeconomic model to assess R&I impact on economic growth by 2014. The model may assist the professional and broader public in understanding the importance of research and innovation for the long-term growth and competitiveness of the country.

3. National progress towards realisation of ERA

3.1 ERA priority 2: Optimal transnational co-operation and competition

Joint research agendas addressing grand challenges and joint programming were insufficiently articulated in Slovak research policies. The [Smart Specialisation Strategy](#) (RIS3 document, chapter 2.5.5) notes a 'low participation in joint programming and Competitiveness and Innovation Framework Programme'. Slovakia participated in nine out of 31 ERA-NET projects, 18 out of 36 European Technology Platforms and three out of 11 joint programming initiatives. Co-operation on infrastructure projects also was limited. The Ministry of Education, Science, Research and Sports (MESRS), for example, has not presented the ESFRI roadmap and the Action Plan on the ESFRI Roadmap by the end of 2014.

The Slovak research system lacked clear thematic priorities in the period 2007-2013/15. There was a trend in losing thematic focus in 2006-2013. The three most important themes (industrial production, agriculture and defence) accounted for some 31.8% of the total GBAORD (by NABS 2007 socio-economic objectives) in 2006. By 2013 the three most important themes (industrial production, healthcare and agriculture) accounted for some 16.2% of the total GBAORD. Outlays on general advancement of knowledge, on the other hand, increased from 39.7% to 69.0% of total GBAORD in the same period.

Slovakia had no roadmap for participation in joint research agendas. Slovakia's participation in joint research agendas, joint calls, and joint programmes developed on an ad hoc basis. The MESRS, for example, supported a call in the Joint Programme in Neurodegenerative Disease Research in 2013. The RIS3 document (Measure 2.4 'Systemic support for and stimulation of international co-operation in science and technology') envisages 'systemic changes in the co-ordination of national policies for Horizon 2020, ERC and ERANET' and support for Slovak scientists participating in international technology platforms. No thematic priorities are stated for international co-operation, but the RIS3 document sets thematic priorities for the whole Slovak system of science and technology (see chapter 2.2 of this report for more details).

The Ministry of Education, Science, Research and Sports (MESRS) manages bilateral exchange and multilateral co-operation schemes in science and technology. The mobility schemes covered the costs of travel, accommodation and subsistence. There were 15 multilateral schemes supporting joint research agendas both with the ERA countries and outside the ERA. The most important agreements outside the ERA referred to Slovakia's participation in the Joint Institute for Nuclear Research in Dubna (Russia). The Information on International Co-operation in Science and Technology in 2013 (MESRS 2014) summarises bilateral and multilateral schemes in S&T co-operation managed by the SRDA. The information hints where future agendas may lay:

- (a) The 15 multilateral schemes supported joint research agendas both with the ERA countries and outside the ERA. The most important initiatives related to the European Organization for Nuclear Research (CERN, €5.47m) and the European X-Ray Laser Project (XFEL, €2.01m). The most important agreements outside the ERA referred to Slovakia's participation in the Joint Institute for Nuclear Research in Dubna (Russia). The total cost of multilateral co-operation was €10.59m, of which membership fees €9.12m and project costs €1.47m in 2013 (2012: €9.20m and

€1.52m). The MESRS published a short evaluation of the project results in the fields of (i) knowledge enhancement, (ii) support for economic growth and (iii) popularising science and technology. Joint publications and joint project proposals were the main outputs in the field (i). The construction of prototypes and the supply of high-tech technologies by Slovak firms were the main outputs in field (ii). Lectures and media presentations were the main outputs in field (iii).

- (b) Ten bilateral schemes supported 151 projects (€0.333m) with eight ERA countries (the Czech Republic, France, Poland, Austria, Romania, Portugal, Greece and Bulgaria) and 27 projects (€0.087m) with China and Serbia in 2013. Bilateral schemes mostly supported mobility projects and covered costs of travel, accommodation and subsistence. The mobility schemes, unfortunately, were not aimed at specific joint research agendas. The SRDA published short evaluation of the project results. Joint publications (512), joint use of research infrastructure (156) and data exchange (144) were most frequently quoted.

The 'Information on International Co-operation in Science and Technology in 2013' document also contains some policy recommendations on multilateral co-operation in S&T. Slovakia should: (a) maintain its membership in multilateral S&T joint research agendas despite high the membership costs and develop close ties with China, Korea and Turkey; (b) concentrate on membership in large research infrastructures (CERN, JINR Dubna, XFEL, ESRF- consortium CENTRALSYNC, IL20/20) and continue membership in EUROSTARS II, COST and ENIC in period 2014-2020.; (c) continue negotiations with the European Space Agency; (d) continue participation in the European co-ordination activities (JRC, ESFRI); (e) start negotiations with the EMBL, strengthening co-operation with NATO (Science for Peace and Security Programme).

No policy document on the European Innovation Partnerships (EIPs) was in force by 2014 in Slovakia. Membership in the EIP happened on an ad hoc basis. Information on Slovakia's activities in the EIPs is scarce. The Slovak Republic is a member of the EIPs on 'Active and Healthy Ageing', 'Agricultural Productivity and Sustainability', 'Water' and 'Raw Materials'. Most Slovak activities concentrate on the 'Active and Healthy Ageing' partnership. Slovakia, for example, participates in the 'Visually Impaired Seniors Active Learning' initiative, 'Patient Medication Adherence' programmes and the 'Knowing Effects on Healthy Life Years' project. As for the Joint Technology Initiatives, Slovakia joined the ECSEL undertaking (Electronic Components and Systems for European Leadership) and supported it with €0.5m in 2013. The Slovak government supported participation in four Eurostars1 projects with €0.1m. The Slovak Government also planned support for activities developed under the European Union Strategy for the Danube Region. Slovak research institutions were interested in two flagship projects of the strategy: the Danube River Research and Management project and the Danube Academy of Dual Education. Financial support for the abovementioned projects should be provided by the Danube Research and Innovation Fund (source: the 2013 Annual Report on R&D).

Public research bodies (higher education institutions and the Slovak Academy of Sciences) implement standard ex-post evaluation procedures (mostly based on scientometric criteria and peer review). The procedures, however, have little impact on research funding by well-performing institutions.

3.2 ERA priority 3: An open labour market for researchers. Facilitating mobility, supporting training and ensuring attractive careers

3.2.1 Introduction

The Slovak public research institutions (Slovak Academy of Sciences, SAS, in particular) and the higher education institutions (HEIs) enjoy a relatively high level of internal autonomy in terms of electing their top representatives and bodies, and setting research agenda. The current autonomy of the SAS and HEIs is limited by (i) their strong dependency on public (national and European) financial resources, and (ii) nation-wide laws on employment conditions.

The academic autonomy of the HEIs is set out in the 131/2002 Law on Higher Education. The HEI is represented by its rector by the academic senate and appointed by the President of the Slovak Republic. The rector is advised by the scientific board, the disciplinary board, the rector's collegiums and the management board. The management board discusses and approves the HEI budget, all other important financial issues, and examines the HEI's long-term development plans and annual reports.

Indent 1 of the 133/2002 Law on the Slovak Academy of Sciences sets out that the SAS is a 'self-governing scientific institutions of the Slovak Republic and its activities aim at developing science, education, culture and economy'. Indent 3 of the Law lists self-governing bodies of the SAS: (a) academic parliament; (b) scientific board of the SAS; and (c) the presidium of the SAS. All members of the research community elect their representatives in the academic parliament. The academic parliament elects the presidium, chairman of the SAS and members of the scientific board. The academic parliament also discusses and approves major documents on the SAS (SAS statute, budget proposal, and annual report). The chairman of the SAS is appointed by the President of the Slovak Republic.

The budget for the HEIs and the SAS is drafted by the Ministry of Finance. SAS and HEIs annually cope with the Ministry's plans for significant budget cuts. The budget is approved by the Slovak Parliament. The SAS and HEIs search for political and public support.

Slovakia had 14.727 researchers in full-time equivalent, some 0.28% of the total population (EU28: 0.23%) in 2013 (source: Eurostat). The total numbers of Slovak researchers increased by 19.2% (EU28: 18.4%) in the period 2007-2013. The HEIs and the business sector accounted for major increases in researcher numbers, while the number of researchers in the government sector (SAS) stagnated during the abovementioned period.

3.2.2 Open, transparent and merit-based recruitment of researchers

The SAS and Slovak HEIs may hire teaching staff, technical staff and/or researchers for fixed-term contracts and/or tenure, depending on their financial resources. The SAS and HEIs have to respect laws and regulations on staff wages. Salaries consist of tariff wages and bonuses. Tariff wages are set by regulations and reflect the experience and excellence of the researchers. Experience is defined by years of service, and excellence by academic degree. Years of service and academic degree need not necessarily match the international reputation of researchers. Bonuses depend on the amount of financial resources available.

The SAS researchers and the HEI teachers are considered civil servants. Employment conditions are set by the 552/2003 Law on Civil Service. Article 3 of the Law sets requirements for civil servants (impeccability, qualification, health conditions, etc.). Tenders are required for managerial positions only (Article 5), but most public bodies advertise posts for all types of employees. If a current managerial contract in civil service expires, the managing authority may appoint a provisional manager for a maximum of six months. Then a tender for the post must be advertised. Any tender must be advertised at least three weeks ahead. Advertisements usually include criteria for the successful candidate (qualifications – certified by relevant documents, experience, language requirements). The decision is taken by a selection panel. The panel must have at least three members and one member must represent the current employees of the public body. The selection panel includes internal members of the tenderer.

Results of the tender must be communicated to applicants within 10 days of the official end of the tender. There is a right of appeal and the possibility of obtaining financial compensation in case of discrimination based on an applicant's gender, race, ethnicity, family issues, political opinions, membership of trade unions, etc.

Any employer can hire a worker for two consecutive years on a temporary contract. After two years the temporary contract turns to permanent one. Workers on temporary contracts have the same rights and duties as workers on permanent contracts.

There is no relevant measure supporting the merit-based recruitment of researchers in Slovakia. Civil servant status determines salary levels for all senior academic and administrative staff. There are mechanisms in place to support merit-based career advancement in HEIs and public researcher organisations.

- The HEIs use their own committees and procedures to award academic titles and job posts of assistant professor ('docent') and full professor²⁵. The criteria include set of research outputs (publications, citations, research grants) and teaching achievements (length of service, numbers of Master and PhD students). Research criteria, however, vastly differ between Slovak HEIs. Top Universities set at least 10-15 papers in journals registered in the SCI and SSCI databases for the title of Professor. Many regional HEIs have no requirement on papers in the SCI/SSCI journals.
- The SAS recognises the job posts of researcher ('grade IIb'), senior researcher ('grade IIa', equivalent of assistant professor) and leading researcher ('grade I', equivalent of research professor). Research outputs (numbers of papers and citations in the SCI/SSCI journals) are the main criterion of career advancement. Criteria for career advancement tend to be much more demanding in the SAS than in HEIs.
- The Slovak Commission for Academic Titles works with the Ministry of Education, Science, Research and Sports. It uses the most stringent research criteria (publications and citations) and awards the highest academic title in Slovakia 'the Doctor of Science' (DrSc.). The title is a matter of pure prestige and has no direct relation to work conditions and/or remuneration.

²⁵ Competences of the Slovak Universities are set in indent 6 of the 131/2002 Law on Higher Education.

The Slovak labour market for researchers is, in theory, fully open to EU and third country researchers. In practice, the Slovak labour market typically has low wages and high unemployment rates. There also is a considerable language barrier. Most employers expect fluent Slovak from job applicants. The 404/2011 Law on Residence by Aliens implemented the 'Blue Card' directive and enabled easier access for highly skilled third-country nationals to the Slovak labour market.

The [2013 National Reform Programme](#) and the [2014 National Reform Programme](#) for the Slovak Republic (NRP) confirmed the government's intentions to abolish the academic titles of 'assistant professor' and 'professor' and introduce merit-based hiring of research and teaching staff (including international experts). There has been no visible progress on this issue.

The Slovak Government planned to reform the system of higher education in order to promote the merit-based recruitment of researchers. It also implemented several programmes supporting human resources in R&D, and international mobility by PhD students and researchers. Plans for the introduction of a merit-based recruitment of researchers (including excellent foreign experts) conflicted with the rather harsh working environment for researchers in Slovakia, such as extremely low pay and underdeveloped research infrastructure. The overall 2014 wage budget for the SAS, for example, was fixed and had to reflect worker entitlements related to qualification and length of service. The SAS may re-distribute only 5% of its total wage budget based on the accreditation result. The average gross monthly wage was a mere €1021 in 2013 (2012: €962; Source: The 2013 Annual Report of the SAS).

There is little data on international mobility by researchers. The Eurostat data indicate some 526 foreign nationals working in Slovak government and HEI sectors by 2012, some 2.4% of the total researchers in headcounts. In 2003 the corresponding share of foreign researchers was 2.1%. The data indicates quite a low level of immigration by highly skilled professionals to the Slovak Republic. No data is available on migration by Slovak scientists. The Slovak Government considered the brain drain a serious problem. The Long-term Objective of the State S&T Policy up to 2015 contained priorities on supporting return migration by Slovak scientists.

It is not legal hindrances, but low salaries, language barriers and poor equipment which impede interests by foreign scientists in applying for jobs and academic posts with Slovak HEI and the SAS.

Mobility by researchers to/from is assisted by the EU programmes, the Marie Curie Actions in particular. The [Country Factsheet for Slovakia](#) on the FP7-PEOPLE Marie Curie Actions states that some 41 Slovak institutions obtained €10.3m for training 198 researchers coming to Slovakia in 2007-2015. Ukraine, Russia, USA, the Czech Republic and Slovenia generated most inflows of researchers to Slovakia. Slovak fellows of the Maria Curie grants mostly headed for the USA and Czech Republic, Ukraine, Russia and the UK.

The Slovak Research and Development Agency (SRDA) launched three calls of the Support to Human Potential Programme (2006, 2007 and 2009). The calls supported 171 projects with €3.47m from public and €0.15m from private resources in the period 2006-2012. The project targeted quite diverse institutions (HEIs, NGOs) and activities (exposure to industry, popularising science, international contests in mathematics and physics for undergraduate and postgraduate students, etc.). The SRDA drafted a similar programme ('Support for Building Personal Infrastructure in All R&D Sectors in 2014-2020 in Slovakia') and

submitted it to the Slovak Government in 2013. The programme would support PhD students in top-notch R&D workplaces, research projects for young researchers, re-integration grants for Slovak researchers working abroad, and grants for foreign researchers wishing to work in Slovakia. The SRDA estimated total costs of the programme for €14.42m, of which €12.54 from the state budget and €1.88m from private resources. The programme was not in force by the end of 2014.

No recent evaluation of hiring and career development practices is available. The Statistical Office of the Slovak Republic published selected results of the 'Scientist Careers' in April 2008. The mailing survey was done on a full sample of all holders of PhD degrees residing in Slovakia by the end of 2006. Some 94% of the survey participants were born in Slovakia and some 99.2% were Slovak citizens. It indicates very low levels of immigration by highly skilled professionals to Slovakia. Some 97.92% of scientists reported employment status, while only some 1.55% was self-employed. Almost two thirds of the survey participants did research, while the rest worked outside the R&D sector. Slovak researchers appreciated the intellectual challenges, independence and social responsibility of their work. Limited career opportunities and low pay, on the other hand, were reported as major sources of dissatisfaction in 2008 ²⁶(see the Slovakia's 2009 ERAWATCH country report for more details). No other national survey of researchers has been conducted since 2008.

3.2.3 Access to and portability of grants

Researchers affiliated in foreign institutions are not allowed to apply for grants funded from the Slovak State Budget, except for schemes on bilateral and multilateral co-operation in science and technology. Support from the Slovak funding bodies and awarded to a Slovak individual or organisation can be spent both on the national territory and abroad (in case the project terms envisage research abroad, membership fees in foreign and international organisations, etc.).

The 172/2005 Law on Organisation of State Support to R&D in theory enables participation by foreign researchers in Slovak research programmes, but there is little experience with this issue, given the limited interest by foreign researchers in working in Slovakia. There is little reason a foreign researcher should apply for a research grant in Slovakia - low salary and poor R&D equipment are a glass ceiling for the attractiveness of research careers in Slovakia both for Slovak and foreign nationals.

No plans for the portability of national grants were scheduled in key R&I policies in Slovakia.

3.2.4 EURAXESS

The Slovak Academic and Information Agency manages the [Slovak version of the EURAXESS](#) webpage since 2004. The EURAXESS offers its services in Bratislava and five other regional capitals (Banská Bystrica, Košice, Prešov, Nitra, and Žilina). The EURAXESS Slovakia mainly quotes available jobs for Slovak researchers wishing to work abroad. Information is important for Slovak researchers seeking better work conditions abroad. The EURAXESS services also include rich information on potential jobs for Slovak researchers abroad.

²⁶ Source: Statistical Office of the Slovak Republic: 'Scientist Careers', April 2008.

For foreign nationals wishing to work in Slovakia the EURAXESS published practical information on entry conditions and legal stay, health insurance, social security, taxation, recognition of diplomas and qualifications, and daily life. Information is updated on an annual basis. The services centres help researchers and their family to plan and organise their move to a foreign country, providing assistance in all matters related to mobility. All services of the EURAXESS Network are free of charge. The EURAXESS also organised the UniverCITY tour for foreign researchers wishing to see Slovakia's regions and regional Universities in April-May 2014.

3.2.5 Doctoral training

Tertiary education is regulated by the 131/2002 on Higher Education. The law sets that higher education institutions may create their own fields of study in tertiary education and apply for approval by the Ministry of Education, Science, Research and Sports (MESRS). The application has to contain relevant details on the name and contents of the field of study, reasoning why the field is needed, examples from abroad of the same field, and a comparison between the proposed and existing fields of study. The application is also evaluated by the Accreditation Commission. The MESRS approves a new or amended field of study once the Accreditation Commission issues its positive opinion.

Two types of PhD courses are provided. 'Internal' PhD students get fellowships paid for by the state, and distributed via HEIs and accredited training places (including the Slovak Academy of Sciences). Fellowships are awarded for three years. Internal PhD students are expected to participate in teaching and research. 'External' PhD programmes are designed for people employed outside the research and HEI sectors and do not involve any direct financial support. External PhD students are expected to defend their theses within five years of the commencement of their studies. Internal PhD students pay no fees for their studies within regular period of studies. External PhD studies pay fees. Fees vary by faculties and study fields. Typical rates were €400-1500 per academic year in 2014/2015²⁷. Some postgraduate programmes are taught in English. Postgraduate students can submit their PhD thesis in several world languages, including English.

There is no explicit support measure aimed at innovative doctoral training in the Slovak Republic. The closest measures include (i) Support for Human Potential Programme by the Slovak Research and Development Agency (see chapter 3.2.2), (ii) National Scholarship Programme and (iii) European initiatives, including Marie Curie Actions.

Slovak doctoral students can benefit from doctoral training programmes implemented by the national authorities and the EU bodies.

The National Scholarship Programme for the Support of the Mobility of Students, PhD Students, university Teachers and Researchers was approved by the Government of the Slovak Republic in 2005. It is funded by the Ministry of Education, Science, Research and Sport of the Slovak Republic. The National Scholarship Programme supports both the inward and outbound mobility of students, PhD students, university teachers and researchers. It is managed by the Slovak Academic and Information Agency. The SAIA runs a well-prepared webpage on the National Scholarship Programme in several languages. The [2013 SAIA Annual Report](#) on the National Scholarship Programme states that the

²⁷ Sources: webpages of the Comenius University, the Slovak University of Technology in Bratislava and the University of Economics in Bratislava.

agency provided 510 scholarships and fellowships for Slovak nationals and 231 scholarships and fellowships for foreign applicants (€0.05m). The SAIA had total budget of €2.69m, of which €1.86m was provided by the MESRS and the rest by foreign fellowship programmes. The total cost of fellowship was €1.36m in 2013.

3.2.6 HR strategy for researchers incorporating the Charter and Code

The Slovak Republic participated in the ERA-SGHRM Working Group on 'Human Resources issues, including the HRS4R' (European Commission 2011²⁸). Two national research organisations signed the Charter for Researchers in Slovakia, the Rectors of the Slovak Higher Education Institutions and the Slovak Academy of Sciences. These two bodies represent about 80% of total researchers in Slovakia.

3.2.7 Education and training systems

The number of PhD students increased from 3875 in the academic year 1988/1989 to 10,009 in 2013/2014 (including distant form of study). Since 2011 the number of PhD students has stagnated. Birth rate declined considerably after 1989. Slovak Universities had to face decreasing enrolment rates in the early 2010s.

The Slovak Government and the Ministry of Education, Science, Research and Sports (MESRS) tend to declare a need for a sufficient supply of (post)graduates in science, technology, engineering and mathematics in order to ensure an appropriate mix of skills among the population. Students, however, used to choose different subjects. Prior to 1989 science and engineering generated the highest number of PhDs. There was a boom in social science and humanities in the 1990s and 2000s. In the academic year 2013/2014 social science and humanities (SSH) accounted for some 45.1% of total PhD students. All private HEIs established in the 1990s and 2000s were focused on SSH fields. The MESRS pointed to high numbers and the low quality of tertiary education in Slovakia in 2012. It announced plans for a ban on applications for new HEIs. The MESRS, however, found it difficult to refuse new applications, once they passed all requirements set by the law. In June 2012 the government agreed with establishing the 'Goethe University'. The government argued the new university accounts for 'top experts and teaching programmes on marketing, international business and tourism in German'.

The MESRS used to state that curricula contents and teaching methods must support critical thinking, problem solving, and creativity. Traditional education in Slovakia, however, is more based on mass teaching and memorising facts. The vast majority of tertiary students take just one field of study. A combination of fields (such economics and physics, engineering and law, etc.) is rare and subject to fees in Slovakia.

The training of young researchers is supported both from the national resources and from the Structural Funds. The Operational Programme Education implements two measures: Measure 1.2 'Tertiary Schools and R&D as Driving Forces in the Development of the Knowledge and Society' and Measure 2.1 'Support of Life-Long Learning'. The results of these programmes were not known by the end of 2014.

²⁸ For more details see: European Commission (2011): ERA-SGHRM Working Group on "Human Resources issues, including the HRS4R and other examples of good practice not directly linked to the Charter & Code.

The merit-based recruitment of young researchers was distorted by an inefficient system of PhD scholarships. For some tertiary graduates PhD studies become an alternative to unemployment and/or an additional source of income. The new system of PhD scholarships enables a preference for quality over quantity of the PhD students. The allocation method for subsidies for PhD scholarships changed: for existing full-time PhD students financial resources are committed for scholarships, while financial resources for new PhD students are not committed and it is up to the individual HEI to decide whether they will be spent on PhD scholarships or otherwise.

The Slovak Research and Development Agency (SRDA) operated the 'Support for Human Potential' programme in 2006-2012. The programme supported, inter alia, international contests in mathematics and physics for undergraduate and postgraduate students, etc.). The SRDA wants to develop a similar programme ('Support for Building Personal Infrastructure in All R&D Sectors') in 2014-2020 (see chapter 3.2.2).

3.3 ERA priority 5: Optimal circulation and access to scientific knowledge

3.3.1 e-Infrastructures and researchers electronic identity

The policies for research and education-related public e-infrastructures and for associated digital research services are implemented by the Slovak Academic Network (SANET). The SANET is an independent civil association (non-profit body), whose members have agreed with conditions to provide each other with Internet services. By 2014 the SANET had 322 members (including all Slovak Universities, institutes of the Slovak Academy of Sciences, scientific libraries, 170 primary and secondary schools and several state institutions and municipalities).²⁹ The SANET has no private sector members.

The SANET is self-managed, but its running costs are paid from the Education and Research Infrastructure chapter of the Ministry of Education, Science, Research and Sports (MESRS). The MESRS subsidised SANET services for high schools and universities (€1.98m in 2014). The MESRS subsidy covered about 90% of the SANET budget. The rest come from users and EU resources.

The SANET implemented four important projects in 2014:

- a) 'SANET for Schools' project aimed at extending the infrastructure of e-services from higher education and academic institutions to public authorities and secondary schools in 77 Slovak cities.
- b) 'SANET2' project aimed at building a high-speed (100 gigabyte) network for the Slovak academic community. The network should be connected to the GEANT trans-European network and the Internet.
- c) Implementing the Eduroam services. The Eduroam (education roaming) is the secure, world-wide roaming access service developed for the international research and education community. Eduroam allows students, researchers and staff from participating institutions to obtain Internet connectivity across campus, and when visiting other participating institutions by simply opening their laptop.

²⁹ All information on SANET activities is contained on the SANET webpage www.sanet.sk.

d) Issuing TERENA Certificate Service (TCS).

Slovakia was a member of the TERENA network and represented via the SANET (Slovak Academic Network). In 2011 the SANET joined the TERENA Certificate Service (TCS) and started the provision of server certificates issued by Comodo CA Limited. The SANET is offering TLS/SSL server certificates via SANET TCS. Most members came from the HEIs sector, Slovak Academy of Sciences and regional Scientific Libraries. The 2013 TERENA compendium states that there were some 36 HEIs, 20 research institutes, 7 institutes of further education, 250 secondary schools, 100 primary schools and 6 libraries connected to TERENA in 2013 in Slovakia. The SANET also worked on a changeover to dark fibre infrastructures and enhancing backbone capacities to 100 Gbps. The new infrastructure should be ready by 2015-2016.

3.3.2 Open Access to publications and data

Slovakia has no national policy on the open access to publications and data. Degree of openness depends on policies by particular Universities and public research institutions. Some authors have supplemented subscription-based access to the publisher's version by self-archiving their own final drafts free for all on the web.

The 2013 report Proportion of Open Access Peer-Reviewed Papers at the European and World Levels—2004-2011 indicates that some 35% scientific papers accounted for the Green & Hybrid Access, 11% for Gold Access and 46% for Open Access in Slovakia in the abovementioned period. Respective numbers for the EU28 were 37%, 8% and 45%³⁰.

There is no national open access repository in Slovakia. The Slovak Government used European resources and enabled subscription to a wide range of scientific journals and databases. Two national projects promote access to and preservation of scientific information:

- Phase 1 of the 'National information system supporting research and development in Slovakia' (NISSRD) project invests €19.9m in the period 2009-2015 and supports the building of an effective system of electronic information support for research and development in Slovakia. Some 25 institutions are programme partners, of which 21 Slovak higher education institutions, three scientific libraries and one information centre. The electronic information resources (EIS) include some 16 databases (Web of Knowledge, Scopus, ProQuest, Science Direct, Wiley, SpringerLink, Knovel, etc.) by five major providers (Association for Computing Machinery, Albertina i come, EBSCO Information Services, SUWECO CZ, Thomson Reuters). Users can access these resources directly or via the new search engine Scientia.sk. Phase 2 of the project invests €8.19m and ensures access to the above-mentioned EIS in the period 2013-2015.
- The 'Infrastructure for research and development - Data centre for research and development' project invests €33.1m in the period 2008-2014 and supports building ICT infrastructure in Slovakia. Two mirror data centres and digitalisation workplaces were established in the cities of Bratislava and Zilina during the first phase of the project in 2010. The second phase of the project concentrated on the purchase and online provision of scientific software for biology and bioinformatics

³⁰ See the report for more details: http://www.science-metrix.com/pdf/SM_EC_OA_Availability_2004-2011.pdf

(ADprot, ADYCit, ExProf, InDelFinder, BioNumerics), and mathematical modelling (MatLab).

Both national projects are implemented by the Slovak Centre of Scientific and Technical Information (SCSTI). The SCSTI is the national information centre and specialized scientific library of the Slovak Republic. It focuses on all branches of technology, and selected areas of natural and economic sciences. The Slovak scientific community, University students and Slovak businesses are beneficiaries of the projects. The support measures implement policy priority on 'Modernising infrastructure, and improving access to scientific information by Slovak scientists and business sector' stated in the Long-term Objective of the State S&T Policy up to 2015.

Evaluation reports on the NISSRD highlight the benefits of central procurement and the provision of electronic information resources in Slovakia (lower costs, flexible negotiations with the resource providers, common marketing and training). Central procurement, however, may not fit some specialised institutions, which lack the finances for purchasing specific information resources (SCSTI 2013).

4. Innovation Union

4.1 Framework conditions

Framework conditions conducive to business investment in research and innovation are underdeveloped in Slovakia. Slovakia has no law on support for innovation. The 185/2009 Law on R&D Stimuli concentrates on support for basic research, applied research and experimental development. The support is given on a case-by-case basis and depends on resources allocated from the State Budget. The overall amount of support is too low to generate a significant impact on innovation development. The amendment of the 595/2003 Law on Income Tax introduced tax relief for R&D performers from 2015 (see section 2.5.3 for more details). Tax relief can be claimed by any organisation performing R&D projects. Tax relief for R&D projects is likely to improve the framework conditions for the development of applied research and innovation in Slovakia.

The first government document on innovation was produced as late as in 2005 (The Competitiveness Strategy – the Lisbon Strategy for Slovakia). The most important framework documents on support for innovation include:

- The 2007 Innovation Strategy and 2008 Innovation Policy and the 2011 Innovation Policy for the planning period 2004-2013/15;
- The 2013 [Smart Specialisation Strategy](#) (RIS3 document) for the planning period 2014-2020.

The 2007 Innovation Strategy concentrated on the implementation of policy measures from the Structural Funds (the Operational Programme Competitiveness and Economic Growth). The 2013 RIS document is a more complex document. Chapters 2.3 and 2.4 of the RIS3 document, for examples, analyse framework conditions for the development of innovations in Slovakia and identify major strengths and weaknesses of the Slovak innovation system. Chapter 5 outlines major legislative, governance and organisational changes needed for (a) developing a framework conducive to the development of innovations and (b) increasing business investment in research and innovation. Policy actions outlined in Chapter 5 of the RIS3 document were included in the [2013 National Reform Programme](#) and the [2014 National Reform Programme](#) for the Slovak Republic.

- Most important legislative actions include amendments to the 175/2005 Law on the State Support to R&D, the 185/2009 Law on R&D Stimuli, the 595/2003 Law on Income Tax and 131/2002 Higher Education Law.
- The most important governance action is the establishment of the Slovak Government Council for Science, Technology and Innovation (SGCSTI). The SGCSTI was established by Government Resolution No. 620/2011 on 28 September 2011, but met for the first time on 9 April 2013 to discuss the first draft of the RIS3 document. The SGCSTI is top governance body for research and innovations in Slovakia. It inter alia discusses and evaluates major policy documents on research and innovations. In May 2014, for example, the SGCSTI discussed the Action Plan for the implementation of the RIS3 document, a draft law on public research institutions and the Analysis of Applied and Experimental Research in the Business Sector.

- The most important plans for organisational actions include: (i) reforming HEIs and the Slovak Academy of Sciences and (ii) merging incumbent eight R&D&I government agencies into two: the Science Agency and the Technology Agency.

The legislative and organisational policy actions should make the Slovak research system more business-friendly, shift government support for R&D from basic to applied research, and change shares of support for basic and applied research from the current ratio of 2:1 to 1:2 by 2020.

4.2 Science-based entrepreneurship

Science-based entrepreneurship has a short history and is underdeveloped in Slovakia. The Research-based Spin-off Scheme (2001-2005) was the first attempt to support science-based entrepreneurship in Slovakia. The Slovak Business Agency (the former NADSME agency) closed the scheme as it faced both a lack of eligible applicants and limited resources subsidising current production costs.

In the planning period 2004-2006/2008 the Sectoral Operational Plan for Industry and Services envisaged €41.25m (of which €30.94m by the ERDF and €10.31m by Slovak central and local governments) for the Business Incubators, Technology Parks and R&D Centres Scheme. The scheme unfortunately could address only Objective 1 regions and excluded the Bratislava Region, where 60% of the Slovak R&D capacities are concentrated. Municipalities in peripheral regions could hardly implement sophisticated projects in R&D centres and/or technology incubators and the scheme failed.

The Operational Programme Research & Development supported some 93 Research and Development Centres (€190m), eight Competence Centres (€57.59m), and 11 University Science Parks (€300m). The high number and generous budget for the University science parks is explained by two factors: (1) the lack of such institutions in Slovakia; and (2) the need to speed up spending by OPRD. Less than half of the budget for the OPRD measures 2.2 and 4.2 was spent by December 2014 (see Table 1b in chapter 2.5.3). All OPRD projects must conclude by the end of 2015³¹.

The RIS3 document (Measure 3.5 'Support to dynamic business environment supportive to entrepreneurship') envisages support for incubators, start-ups and risk-capital schemes to foster science-based entrepreneurship in the planning period 2014-2020. The Operational Programme Research and Innovation (OPRI, major source of finance for the RIS3 document) envisages grants and risk capital schemes to support seven research institutions collaborating with the business sector and 45 start-ups and spin-offs in the Bratislava Region, and 40 institutions and 265 start-ups and spin-offs in non-Bratislava regions. First calls from the OPRI are expected in 2015. The OPRI also envisages support for (i) University science parks 'located in the physical proximity of HEIs and/or the Slovak Academy of Sciences') and (ii) R&D centres (virtual associations of research institutions).

Science-based entrepreneurship is also supported by two new policy measures since 2015 in Slovakia. The R&D tax-reliefs are in force since January 2015. R&D-intensive businesses

³¹ The Slovak media raised questions about the sustainability of the University science parks once the EU schemes terminate. Rectors of Slovak Universities, however, pointed to the development of their contacts with the business sector and were optimistic about covering the running costs of the parks in the future. See Pravda daily (2013): [Vedecké parky si školy musia udržať samy](#) (*The schools will have to maintain their science parks*).

may apply a 25% super-deduction from their tax base for the wages of researchers younger than 26 years (see chapter 2.5.3 for more details). Young entrepreneurs may also ask for grants under the Spot Booster accelerator. The accelerator is a member of the European consortium of software accelerators CEED Tech and aims at support for fast-growing IT businesses and allocates a total support €5m in 2014 and 2015³².

4.3 Knowledge markets

The knowledge markets are rather undeveloped in Slovakia. Intellectual property rights are governed by the 435/2001 Law on Patents and Trade Marks. The last amendment to the law was in 2009. The law defined the main types of intellectual property rights (patents, trademarks, licenses) and sets procedures for patent applications and the protection of intellectual property rights. The law also implemented the European Patent Convention in Slovakia. The 506/2009 amendment of the law implemented Council Directive 2008/95/EC on trademarks.

The Industrial Property Office offered a life-long learning programme on intellectual property rights (IPR) for entrepreneurs in 2013 and 2014. The programme modules included (a) basics of the IPR law; (b) marketing, management and economics of creative processes; (c) information on IPR, and (d) advanced IPR law.

The 2013 Annual Report on R&D contains some basic patent statistics. There were some 14,218 patents (of which 11,463 by European authors) registered in Slovakia by end of 2013. The number of patent applications rather decreased over the last five years (2009: 239 applications; 2013: 210 applications). Domestic applications outnumbered foreign ones in the last five years (2009: 176; 2013: 184). Similar trends were observed for numbers of industrial designs (2009: total of 331 applications, of which 237 domestic; 2013: 429 total applications, of which 339 domestic).

While statistics on applications to the national patent office are not always comparable across countries, they can provide some indication of technological development activities that are not captured by EPO/PCT data. In Slovakia 255 patent applications were made at the EPO during the period 2000-2010. Some 415 patent applicants took the PCT route. The National Patent Office received over 2242 applications during this period (these three figures are based on fractional counting).³³

The Operational Programme Research and Innovation (OPRI) envisages grants and risk capital schemes to support some 30 patents, industrial designs and trade marks in the Bratislava Region, and 390 intellectual property rights in the non-Bratislava regions in period 2014-2020.

4.4 Knowledge transfer and open innovation

The Major knowledge transfer schemes are supported by the Operational Programme Research and Development (OPRD: Policy Measures 2.2 and 4.2; see table 1b in section 2.5.3). The OPRD implements two national projects promoting knowledge transfer:

³² For more details see the accelerator webpage <http://www.booster.sk/>.

³³ Source: KU Leuven, Bocconi University, "Patents and Licensing study" for DG RTD – data release summer 2014.

- The 'Transfer of knowledge and technology from research and development into practice' project invests €226.9m in the period 2008-2013/15 and supports (i) building University science parks and research centres with Slovak HEIs and the Slovak Academy of Sciences; (ii) applied research projects; and (iii) R&D co-operation projects. Most projects (including University science parks) conclude in 2015 and it is too early to evaluate their impacts³⁴.
- The 'National infrastructure supporting technology transfer in Slovakia' project invests €8.2m in the period 2010-2015 and supports establishing technology transfer centres in Slovak Universities and public research organisations. The Slovak Academy of Sciences, for example, established the Office for Technology and Knowledge Transfer and the Protection of Intellectual Property. Conferences and seminars on technology transfer, the protection of intellectual property rights and commercialisation of research results are the main activities of the technology transfer centres³⁵.

The Operational Programme Competitiveness and Economic Growth (OPCEG) has been the single largest source of support to Slovak SMEs. The OPCEG Measure 1.1 'Innovation and technology transfers' has allocated about €530.5m to over 1181 businesses by December 2014. The bulk of assistance supported the purchase of new technologies by Slovak SMEs in manufacturing industries. The maximum support per project varied from €0.02m to €6.0m.

The pilot Innovation Voucher scheme was launched under the 71/2013 law in June 2013. The pilot scheme is managed by the Slovak Innovation and Energy Agency (SIEA) and financed from the state budget. The de minimis scheme allocated €100,000 in total and the value of each voucher was set to €3,500 in 2013. The scheme also continued in 2014. The value of each voucher increased to €5,000 and the total budget of the scheme to €235,000. Firms can exchange vouchers with certified research workplaces. The SIEA certified 54 research institutions by 2014.

There was no consistent data on co-operation between public and private sectors, researchers' mobility and/or joint collaborative research agendas. There is some anecdotal evidence on such activities. The Slovak Academy of Sciences (SAS, the prime research performer in Slovakia), for example, applied for 15 and obtained 4 patents in 2013. The SAS also signed 52 business research contracts and participated in 23 collaborative workplaces with the businesses. Total revenue from these activities was €0.972m, about 1% of the total SAS revenue in 2013 (source: 2013 Annual Report of the SAS).

The Ministry of Education, Science, Research and Sports (MESRS) drafted a new framework for the evaluation of the RIS3 document in autumn 2014. The framework should be part of the updated Action Plan for RIS3 document. The new set of indicators may include data on researchers' mobility. The MESRS considered contacting the Social Security and asking for

³⁴ The Priority Axes 2 and 4 of the OPRD set cumulative targets the EPO patent applications (46+39) and numbers of spin-offs (33+39) by 2015. The 2013 Annual Report on Implementation of the OPRD stated that there were no EPO patent application and no spin-off reported by the project holders. Numbers of EPOs and spin-offs should be known after official end of projects.

³⁵ No impact study is available for this national project. The Slovak Centre for Scientific and Technology Information hosts the National Centre for Transfer of Technologies (NCTT). The centre reports no outputs in terms of patents, trademarks and other forms of IPR supported by the national project. It reports no. of support services in terms of conferences, seminars and workshops. The centre also prepares an annual 'Methodology for evaluating quality of science workplaces in research, development, innovation and technology transfers'. The methodology is used to evaluate Slovak higher education institutions.

data on researchers changing their employment between the public and private sectors, and/or between various industries.

Framework conditions to incentivise and reward academics engaged in cooperation with industry/users have been missing in Slovakia so far. Researchers in the SAS and HEIs are evaluated according to their publication, citation and teaching achievements. The commercialisation of research results plays little role in career advancement for public sector researchers.

4.5 Innovation framework for SMEs

The Slovak Republic applies several financial and non-financial schemes supporting innovations in small and medium enterprises (SMEs).

The majority of funding comes from European resources.

- The JEREMIE initiative provides risk capital for small and medium enterprises. The scheme should have started in 2008, but it was delayed several times for administrative complexity. The total capital allocated to the JEREMIE holding fund is €100m in the period 2007-2013/15.
- The 2013 Report on State Aid sets out that seven SMEs benefited from the (general) aid in R&D projects of €2.16m in 2013, of which €1.69m from European resources. The State Aid also was provided to 174 enterprises in field of research and development in the same year (€34.42m, of which €20.9m from European resources. Source: Ministry of Finance, [2013 State Aid Report](#)).
- The Business and Innovation Centre in Bratislava organised several workshops and seminars for SMEs related to the SME Instrument programme. The success rate by Slovak SMEs seemed low by the end of 2015³⁶.

The [Slovak Business Agency](#) (SBA) is the successor of the former NADSME agency and is the oldest specialized non-profit organization for the support of SMEs in Slovakia. It was founded in 1993 by a joint initiative between the EU, the Government of the Slovak Republic and the Slovak business association. EU resources (the PHARE programme and since 2004 the Structural Funds) have been the most important sources of funds distributed via the agency³⁷. The SBA manages several microloan and risk capital schemes, provides analyses of business environments and introduces projects aimed at the implementation of the Small Business Act and promoting clusters, innovations, eco-innovations, and support for female entrepreneurship. The SBA also manages programmes for education, training and consultation services for selected population groups who are interested in doing business (graduates, women, elderly workers, migrants, and unemployed). The SBA provides several financial support schemes to Slovak SMEs:

³⁶ Source: Interview with Mr. Ivan Filus, Manager with the Business and Innovation Centre in Bratislava + Horizon 2020 NCP for Risk Capital and Innovation in SMEs.

³⁷ The Slovak Government found problems with corruption and mismanagement of national and European resources in the NADSME in 2010. Some managers were in a conflict of interest and invested the agency's money into their own businesses. The government announced plans for abolishing the agency and/or merging it with other government agencies. The intention proved more complicated than expected. The associations of entrepreneurs and crafts, co-founders of the NADSME, had different opinions on the agency's future status. The agency's management and operations were revamped and the NADSME changed its name to the Slovak Business Agency on 28.02.2014.

- The microloan programme has been implemented since 1997 and can be used for procuring tangible and intangible investments in property, reconstruction of operating spaces as well as the purchase of necessary stocks, raw material or goods and other investment projects. The minimum amount of a micro loan is €2,500 and the maximum €50,000. Since 1997 the Microloans Programme has provided 1,827 microloans (31.20m).
- The venture capital funds are provided via a specialised subsidiary company – the Fund of Funds (see chapter 4.6 for more details).

National schemes supporting SMEs allocated much lower funding than the European ones, but accounted for lower levels of administrative complexity. The pilot Cluster scheme allocated €0.2m in total in 2013. The 2014 round of the *de minimis* scheme allocated €0.113m in total. Particular projects could receive a €10,000-20,000 support (up to 70% of the total eligible costs).

Funding schemes supported by national and European resources are regularly monitored, but no benchmarking against comparable schemes in other countries is available.

The Operational Programme Research and Innovation (OPRI) envisages grants and risk-capital schemes for small and medium-sized enterprises (SMEs) to support start-ups in the knowledge-intensive sectors; business advice and networking, cluster schemes, and the small business innovation research projects. Over 5,000 SMEs should be supported in the Bratislava Region and about 5,000 ones in the non-Bratislava regions during the period 2014-2020.

The Slovak Republic passed standard European insolvency regulations to support the financial reorganisation of enterprises. Insolvency regulations help release capital from failing businesses and support the Schumpeterian process of creative destruction. However, the number of insolvency cases was low. The Slovak Credit Bureau reported 394 insolvency and 108 re-structuring cases in 2013. There were about 165,000 SMEs and 353,000 single person businesses in 2014 in Slovakia (source: Statistical Office of the Slovak Republic).

4.6 Venture capital markets

The Slovak capital market accounts for low levels of development. The [2013 Central and Eastern Europe Statistics Report](#) on venture capital states that the total private equity investment was €97.8m in 2012 and €2.0m in 2013 (0.138% and 0.012% of GDP respectively). The venture capital shares of GDP were well below the European averages (0.262% and 0.253% respectively; source: European Venture Capital Association).

The Bratislava Stock Exchange was established in 1991, but the stock market was almost dead in the 2010s. Slovak companies had to look for bank loans and/or use alternative sources of finance.

The history of the Slovak venture capital market goes back to 1997, when the first funds were created within the former NADSME agency (see chapter 4.5). The agency tried to support business angel networks. It also managed several venture capital funds (operating under the 'Fund of Funds' scheme), but failed to support innovative companies. The former Fund of Funds was rebranded the National Holding Fund (NHF). By 2014 the NHF managed three venture capital funds: (1) Slovak Growth Capital Fund; (2) Fund for Innovations and

Technology, and (3) Slovak Development Fund. The Fund for Innovations and Technology provided business advice and risk capital investments (from €0.02m to €1.50m) for a period of 4-6 years. By 2014 the fund supported only one company (€0.5m)³⁸.

No favourable taxation regime for venture capital and/or business angels was in place in 2014 in Slovakia. In June 2014 the Slovak government announced plans for a package of 15 pro-growth and pro-social policies to be implemented in 2015. The package contains a plan to provide tax relief for start-ups established by 'young and talented entrepreneurs'. No financial details of support were specified.

Many Slovak entrepreneurs relied on self-help. The Association of Young Slovak Entrepreneurs, for example, established its Business Angels Network in 2011. The network associated some 25 investors by 2014. It also established an online platform, ideamarkt.sk, to support networking between investors and young entrepreneurs. The [Slovak Venture Capital and Private Equity Association](#) (SLOVCA) was established in 1995. Its primary purpose was to 'increase the awareness of the public of the availability of private equity and venture capital for entrepreneurs, as well as for other investment and banking institutions, and economic, political and regulatory bodies in Slovakia'. The SLOVCA associates five members, three associate members and a number of partners. The SLOVCA and the Association of Young Slovak Entrepreneurs launched an innovation prize competition 'The Business Idea of the Year'. Most ideas come from the IT sector. The logopaedic software game 'Speekle' and the World's smallest USB charger 'CulCharge' won the prize in 2013.

4.7 Innovative public procurement

The Slovak Republic has not yet set any national target for public procurement of innovative goods and services. The procurement of innovative technologies is limited to e-government services. The e-government projects are relatively new and strongly needed in Slovakia. The online availability of public services to citizens and businesses lagged behind the EU averages in Slovakia. According to the 2011 Innobarometer, government procurement was a poor driver of business innovation in Slovakia (source: European Commission 2013: European Public Sector Innovation Scoreboard 2013³⁹). Tenders usually set price/quality specifications, with price being more important due to austerity considerations. Procurement of e-government services generated mixed results.

The [electronic land register](#) (Cadastre) probably was the most successful e-government project. It was funded from national resources. The Cadastre Portal has been operating well since 2004.

Since 2007 most e-government initiatives have been supported by EU funding. Priority 1 'E-government and development of e-services' of the [Operational Programme Information Society](#) (OPIS) allocates €808.13m in the period 2007-2013/2015 (of which €697.26m by the ERDF and €110.86m by the Slovak State Budget). The large-scale infrastructure projects faced administrative burdens and technology problems. Particular branches of central and local government developed their own systems of e-government during the

³⁸ The Datamolino start-up turned invoices into structured electronic documents that could be directly imported into accounting systems.

³⁹ The Global Competitiveness Reports by the World Economic Forum also indicate low levels of innovative public procurement in Slovakia.

2000s. The integration of local and sectoral e-government systems proved to be difficult. Only about half of the OPIS means were spent by October 2014 (see chapter 2.5.3 for more details). Low spending was related to the slow progress of some key e-government projects.

Good examples of innovative public procurement include:

- The national information system supporting research and development in Slovakia. This support measure aims at creating an optimal portfolio of electronic information resources for R&D in Slovakia, including a database of Slovak e-resources for R&D and enlarging and improving the [Central Information Portal for R&D and innovation](#) (CIPRDI).
- The infrastructure for research and development – Data centre for research and development. The basic idea of the measure is that public sector should build an efficient ICT infrastructure for R&D in the period 2009-2013. The infrastructure should be able to store and provide data for R&D workers with a high degree of availability and security. Fast and reliable broadband networks, solutions for efficient information use and processing, and Intranet and Internet solutions are also parts of the ICT infrastructure.
- The [Central Register of Contracts](#) (CRC). Slovakia faces relatively high rates of corruption⁴⁰. The Slovak Government passed the 546/2010 Law (amending the 211/2000 Law on free access to information). The law set out that all contracts and purchases made by departments and agencies of the central, regional and local governments must be published on the internet not later than 10 days after the purchase. Information on financial transactions must be published in a structured way and enable an easy identification of the relevant actors and the expenditures involved. The CRC works well and somewhat helps increasing the transparency of public procurement in Slovakia.
- The Electronic Identity Card project (eID) enabled the issuance of ID cards with built-in chips from December 2013. By June 2014 some 281,000 eID cards were issued. The government guaranteed the low price of the eID card (€4.50), and ensured the free distribution of card readers and respective software solutions. About one half of the eID card holders opted for the activation of digital signature. The digital signature simplifies dealings with many [public administration services](#).

Bad examples of innovative public procurement include:

- *The UNITAS project* has been a major initiative aimed at improving the efficiency of Slovak financial authorities. The project involved several partial but interconnected projects aimed at unifying tax, duties and social insurance payments by 2013. The cumulative costs of the UNITAS projects were estimated in €243.0m and the benefits in €328.4m in the period 2010-2017 (source: Government Resolution No. 32519/2011 of 31 August 2011). The project, however, faced substantial technical and managerial difficulties. The software solution part of the project failed spectacularly in March 2012, just before the general elections. Staff in the tax offices had to process tax submissions on paper. Problems with the replacement of software solutions opened ways for tax evasion and tax frauds. The failure

⁴⁰ The [2014/2015 Global Competitiveness Report](#) (p. 336) identified 'Inefficient government bureaucracy' and 'Corruption' the most problematic factors for doing business in Slovakia.

contributed to the downfall of government of Ms Radicova. The time schedule of the project changed several times. The 2014 National Reform Programme states that the second stage of the UNITAS II project (initiation and unification of annual accounts of social contributions) should be ready by January 2016.

- [The e-Health project](#). The project was approved via Slovak Government Resolution No 497/2008 of 16 July 2008. Deliverance of outputs was redefined into three phases: Phase 1 (2011 – 2012): 'Implementation of basic e-Health functionalities leading to operation financing and implementation of necessary assumptions for setting functionalities bringing benefits for citizens in the shortest possible time ('quick-wins')'.

Phase 2 (2012 – 2013): 'Implementation of functionalities bringing mainly qualitative benefits for the Slovak citizens'.

Phase 3 (2014 – 2016): 'Improvement in preventive care and implementation of personalized medicine through the newest technologies, helping citizens to take care on their health in more efficient and targeted ways]. As a matter of fact, none of the e-Health project outputs was operational by October 2014.

The Operational Programme Research and Innovation (OPRI, major source of finance for the Slovak research and innovation system in 2014-2020) makes no special provision for the public procurement of innovative technologies. The OPRI only briefly mentions that 'the state aid schemes would prioritise the procurement of top-notch technologies according to the RIS3 goals'.

The lack of clear national policies and targets for the public procurement of innovative goods and services, and excessive reliance on the EU resources impacts the efficiency of innovative public procurement in Slovakia. There is a question of the sustainability of some e-government programmes once EU resources dwindle.

5. Performance of the National Research and Innovation System

5.1 Performance of the National Research and Innovation system

Table 2: Assessment of the Performance of the National Research and Innovation System

1. ENABLERS	Year	SK	EU
Human resources			
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	2011	1.90	1.70
Percentage population aged 30-34 having completed tertiary education	2012	23.70	35.80
Open, excellent and attractive research systems			
International scientific co-publications per million population	2012	399.12	343.15
Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	2009	3.97	10.95
Finance and support			
R&D expenditure in the public sector as % of GDP	2012	0.48	0.75
Venture capital (early stage, expansion and replacement) as % of GDP	2012	N/A	0.08
2. FIRM ACTIVITIES			
R&D expenditure in the business sector as % of GDP	2012	0.34	1.31
Linkages and entrepreneurship			
Public-private co-publications per million population	2011	15.65	52.84
Intellectual assets			
PCT patent applications per billion GDP (in PPSE)	2010	0.44	3.92
PCT patent applications in societal challenges per billion GDP (in PPSE) (climate change mitigation; health)	2010	0.02	0.85
3. OUTPUTS			
Economic effects			
Contribution of medium and high-tech product exports to trade balance	2012	3.88	1.27
Knowledge-intensive services exports as % total service exports	2011	22.07	45.26
License and patent revenues from abroad as % of GDP	2012	0.01	0.59

Source: European Commission, IUS Database (2014).

The 2014 Innovation Union Scoreboard (IUS) data indicates that Slovakia has made a modest progress towards developing a knowledge-based economy since 2007. The absolute value of the Summary Innovation Index (SII) changed little during the period 2007-2012 (0.295 versus 0.328). The gap against the EU-28 SII value (0.517 versus

0.554) remained about the same. Slovakia's position against its main competitors in the region (the Czech Republic, Hungary and Poland) somewhat improved in the above-mentioned period.

An analysis of the SII components indicates that Slovakia matches/surpasses the European standard in few indicators (Table 2). Some of these favourable indicators (new doctoral students and/or youth with upper secondary level of education) should be considered within a broader socio-economic context:

- High supply of secondary and tertiary education points to mass rather than high-quality education.
- Slovak students considered high unemployment rates, income gaps and poor quality of local Universities, and increasingly sought education abroad. There was a serious risk of a brain-drain. The Slovak supply of human resources, in fact, matched the demand for tertiary graduates in the Czech Republic, Austria and the UK⁴¹.

The shares of medium- and high tech exports in total exports refer to Slovakia's dependency on two key industries (automotive and consumer electronics) introduced by multinational companies, rather than the country's own effort to develop high-value added production. Slovakia's over-specialisation in a few capital-intensive and cyclically sensitive sectors makes the country vulnerable to sudden external shocks (as in 2009).

Low inputs (in terms of public and business R&D spending) corresponded with low outputs, as measured by high quality scientific publications, exports of knowledge-intensive business services, and numbers of SMEs introducing process, product and/or marketing innovations. While Slovak scientists developed broad networks of international co-operation, few of them are able to access top-notch researcher infrastructures abroad and develop co-operation with star research performers. Slovakia accounted for low shares of scientific publications among the top 10% most cited publications worldwide. Service exports concentrated on the land-based transport of goods (including pipelines for Russian oil and gas) and short-term tourism trips⁴². Slovakia was able to develop the fast-growing sector of IT services, but the development of other knowledge-intensive services (research and development, architecture and design, business services) lagged behind the European average. According to the 2014 [Country Profile in Research and Innovation Performance](#) 'Slovakia did not significantly improve either its scientific production rate or, consequently, new production technologies, which resulted in a very poor performance in intellectual assets (PCT patent applications, licence and patent revenues)' (European Commission 2014).

On average in 2011, Slovakia produced 15.65 publications per 10,000 inhabitants, well below the EU-28 average (52.84). They are also internationally orientated with 42.60% of publications internationally co-published. In 2012, Slovakia had about 427 international scientific co-publications per million population (Austria: 13414; Czech Republic: 598, Hungary: 432). In the period 2002-2012, some 5.5% of the Slovak scientific publications

⁴¹ Average unemployment rates for tertiary graduates in age group 25-29 were 10.7% in the EU28 and 13.5% in Slovakia in 2013 (source: Eurostat). Numbers of tertiary Slovak students abroad increased from 3040 (2.6% of total Slovak students) in 1998 to 35555 (15.7% of total Slovak students) in 2012 (source: OECD database on international student migration). The Czech Republic (24819 students), UK (3046 students) and Austria (1717 students) were prime migration destinations for Slovak tertiary students in 2012.

⁴² Source: Eurostat (2015) Balance of Payment Statistics.

were in the top 10% most cited publications worldwide in comparison with 11% of top scientific publications produced in the EU28 (Science Metrix, 2014)⁴³. The share of public-private co-publications in Slovakia is 0.8% in the period 2008-2013 against 2.8% for the EU28⁴⁴.

The structure of the IUS indicator set, however, only partly described the relation between inputs and outputs in Slovakia's economy. The Slovak economy accounted for high stock of the foreign direct investment and was dominated by branches of multinational companies (MNCs), in car-making and consumer electronics in particular⁴⁵. Slovakia significantly benefited from the transfer of high technologies and top managerial practices by MNCs. The labour productivity (per hour worked, in purchasing power parity) increased from 46.9% of the EU average to 73.8% in the period 1995-2013. The IUS indicators mostly concentrate on SMEs and are not able to mirror the process of technology diffusion by MNCs and increases in labour productivity in small and open economies.

Some limitations of the IUS indicators also apply to R&I outputs. Slovakia accounts for very poor performance in intellectual assets (PCT patent applications, and licence & patent revenues). This performance relates both to the low BERD and the absence of headquarters of the multinational companies. Some global firms with high patent intensity were located in the Slovak Republic (Samsung, Volkswagen, Hyundai-Kia), but filled in their patents elsewhere.

5.2 Structural challenges of the national R&I system

The key challenges in the national innovation system have been continuing for many years and identified in the key government documents on innovation policies (the 2007 Innovation Strategy, and the 2008 and 2011 Innovation Policy and research policies (the 2007 Long-term Objective of the State S&T Policy up to 2015)⁴⁶.

- **Challenge 1: Weak R&D system disables co-operation between academia and industry sectors.** Economic and social transition heavily impacted the Slovak research system in the 1990s and 2000s. Slovak government and businesses coped with a great array of short-term, but urgent problems and abandoned some long-term tasks (including investment in research and higher education). The share of gross expenditure on research and development (GERD) in the gross domestic product (GDP) fell from 3.88% in 1989 to 0.82% in 2012⁴⁷. Slovak R&D spending was one of the lowest in Europe (EU27 average = 2.07% in 2012), and also very

⁴³ These publication data are based on Elsevier's Scopus database. ScienceMetrix, Analysis and Regular Update of Bibliometric Indicators, study conducted for DG RTD. They represent an update of the data displayed in the table below. See also http://ec.europa.eu/research/innovation-union/index_en.cfm?pg=other-studies.

⁴⁴ Scival 2014, Scopus based publication indicators derived from Elsevier's SciVal platform, www.scival.com last accessed December 2014.

⁴⁵ Stock of the foreign direct investment amounted to €42.660m (57.9% GDP) in 2013 in Slovakia. Source: Eurostat (2015): International investment position, annual data; and author's computations.

⁴⁶ For comprehensive list and details of key policy documents on research and innovations see the 2010 Mini Country Report for the Slovak Republic.

⁴⁷ The 2009 share of GERD in GDP was 0.48%. Increase in intensity of R&D spending to 0.63% GDP in 2010, 0.68% GDP 2011 and 0.82% in 2012 reflects higher spending by the Operational Programmes 'Research and Development' and 'Competitiveness and Economic Growth' in 2010. Source: Eurostat.

low against the reference group countries (CZ+IT+HU+SI+SK = 1.27%)⁴⁸. The share of business expenditure on research and development (BERD) in GDP was 0.34% in Slovakia while 1.31% in 2012 in the EU27 (Source: Eurostat, see chapter 2.2 for more details). European assistance helped building and modernising research infrastructure, but was not matched by national investments in high-quality human resources for R&D. Slovakia accounted for a relatively educated labour force, but failed to move to an R&D-intensive employment structure. Low numbers of R&D workers also reflected a limited interest by Slovak companies in R&D intensive production (see challenge 4).

- **Challenge 2: Underdeveloped system of innovation governance.** The history of modern innovation policy in Slovakia is quite short. Innovation was not considered a priority until 2005 when the Competitiveness Strategy (the Lisbon Strategy for Slovakia) was passed. The 2007 Innovation Strategy referred to an 'absence of strategic policies supporting innovations, low numbers and a fragmented system of explicit innovation policy measures, and poor innovation management, co-ordination and monitoring'. The Ministry of Education, Science, Research and Sports drafted and implemented research policies, while the Ministry of Economy concentrated on innovation policies. The ministries often were managed by different members of government coalitions and did not co-operate well. Slovakia had no national innovation plan and/or functional national innovation council until the adoption of the [RIS3 document](#) in November 2013. The regional governments had quite limited legislative powers and financial resources for developing research and innovation. The flagship initiative of the 2007 Innovation Strategy, the 'Regional Innovation Centres' (RICs), proved too complex to implement and was cancelled by the Slovak Government in 2011⁴⁹.
- **Challenge 3: Dual economy.** Branches of multinational companies (MNCs) provide for a significant part of Slovak industrial output and exports (Samsung, Volkswagen, Siemens, Hyundai-Kia, Peugeot-Citroen, US Steel). No MNC had its headquarters in Slovakia. The MNC were attracted by the low cost of inputs (labour in particular), the geographical location of Slovakia and favourable tax conditions. The MNCs did research in their headquarters and had a limited interest in shifting their applied/industrial research to Slovak Universities and research institutes. The 2013 EU Industrial R&D Investment Scoreboard contained no Slovak company. The lack of a strong Slovak-based MNC (like Nokia or Volkswagen) significantly affected private spending on R&D. The R&D investment by the Volkswagen group (€11.74b), for example, was 16 times higher than the total Slovak GERD and 41.5 times higher than the Slovak BERD in 2013 (source: the 2014 EU Industrial R&D Investment Scoreboard). Some 165 thousands of Slovak small and medium sized enterprises (SMEs⁵⁰) compete with low costs of inputs. A rather excessive focus on SMEs has been a potential weakness of Slovak innovation policies. Branches of MNCs accounted for the bulk of high and medium-tech exports⁵¹ and high rates of

⁴⁸ For country grouping see the [Innovation Union Competitiveness \(IUC\) report](#).

⁴⁹ For details of failure of the RIC scheme see the 2011 [Mini Country Report for Slovak Republic](#) under Specific Contract for the Integration of INNO Policy TrendChart with ERAWATCH (2011-2013)

⁵⁰ Source: Statistical Office of the Slovak Republic (2015): Economic subjects by selected legal forms (1993 - 2014)

⁵¹ Two industries (manufacture of car and car components, and consumer electronics) accounted for 42.3% of the total Slovak exports of goods in 2013.

technology transfer and diffusion, but were not targeted by any innovation policy measures in Slovakia.

- **Challenge 4: Low shares of domestic innovative enterprises limit the competitiveness of the country.** The dual structure of the national economy is reflected in the low intensity of BERD, low shares of SMEs innovating in-house and low numbers of patents, industrial designs and other commercial results of research and innovations. Most Slovak SMEs considered investment in research and innovation risky and with uncertain results, and bet on low costs of labour and a good price/quality ratio. Average monthly labour costs in industry, construction and services were €1,207 in Slovakia, but €4,009 in Austria, €4,084 in Germany, €4,543 in the Netherlands and €4,552 in Belgium in 2011 (source: Eurostat). Some 21.8% of Slovak enterprises innovated in-house, while 39.8% of enterprises were engaged in such innovation activities in 36.3% in Austria, 45.2% in Germany, 39.1% in the Netherlands and 31.8% in Belgium in 2010 (source: the 2013 Innovation Union Scoreboard). The lack of strong domestic R&D-intensive companies may be partly alleviated by the introduction of demand-based innovation and R&D policies. Public procurement of research and innovation, however, is scarce and inefficient in Slovakia (see chapter 4.7 for more details). No Slovak innovation and/or research policy document mentions the public procurement of innovative technologies⁵².
- **Challenge 5: Inadequate national innovation funding.** The national innovation funding earmarked by the 2011 Innovation Policy for the period 2011-2013 (€5.05m) is a fraction of the European one (€90.55m). The 2011 Innovation Policy acknowledged 'disproportional reliance by innovation policies on European and international financial assistance' and called for increased national funding for innovation. It is unclear, however, from where the national support to innovation should come. The key support measures (no. 9 'The national motivation project for increasing efficiency of innovations in Slovakia', no. 10 'Supporting innovative activities in enterprises' and no. 11 the 'JEREMIE') are assisted by the Operational Programme Competitiveness and Economic Growth (measure 1.1, see chapter 2.5.3, Table 1b). The national innovation funding also accounts for a limited portfolio of funding forms and lack of clear thematic focus. Slovak businesses would benefit from higher national funding, as the national schemes used to account for much lower administrative and higher flexibility than schemes supported by the Structural Funds.

5.3 Meeting structural challenges

Challenge 1 is addressed by a numbers of schemes under the 2007-2013/15 innovation policy mix. The majority of the policy measures target building a R&D infrastructure, building links between academia and industry sectors and support for technology transfer. They are supported from the Operational Programmes 'Research and Development' (OPRD) and 'Competitiveness and Economic Growth' (OPCEG) (see chapter 2.5.3 and Table 1b for more details). Most projects supported from these measures end in 2015. No comprehensive evaluation has been provided so far. The measures may help founding a sound R&D system, if the policy mix is implemented in a consistent way. The OPRD and

⁵² For more details see the 2011 [MiniCountry Report for the Slovak Republic](#).

OPCEG policy measures are implemented by different ministries (MESRS and Ministry of Economy) and there is little evidence on synergies between the programmes.

Challenge 2 accounted for some progress in 2014. The top body for R&I governance, the Slovak Government Council for Science, Technology and Innovation (SGCSTI) finally became functional in April 2013. The SGCSTI was quite active and approved a number of important R&I policy documents, including the RIS3 strategy in 2013 and 2014. There, however, was no progress in building a regional system of innovation governance. The Slovak Government also considered a reform of the higher education institutions (HEIs) and public research bodies (PROs). Implementing more efficient and transparent evaluation techniques and reforming some key research performer institutions (SRDA and SAS in particular) should push HEIs and PROs from quantitative targets towards qualitative ones, and promote the efficient use of public spending on education and research. Laws and regulations for implementing the above-mentioned reforms were not ready by end of 2014.

Challenge 3 on a dual economy was for the first time recognised in the RIS3 document. The document proposed a number of policy measures aimed at increasing the embeddedness and related variety of the key Slovak industries (linking Slovak SMEs with branches of MNCs via clusters, innovation partnerships, joint research centres, applied research grants, etc.). The final goal of these measures is the integration of Slovak firms into global value chains and increasing levels of added value in products made in Slovakia. Policy measures addressing challenge 3 will be developed and implemented during the programming period 2014-2020. The Operational Programme Research and Innovations provides for the bulk of finance (€3988m) for addressing the challenge of dual economy.

Challenge 4 on low innovativeness by Slovak SMEs is addressed mainly by the OPCEG policy measures and very modest national funding (see chapter 2.5.3 for more details). The OPCEG is implemented by the Slovak Innovation and Energy Agency and invests €968.3m from the ERDF and €170.9m from the Slovak state budget in the period 2007-2013/15⁵³. The OPCEG policy measures have high budgets, but ambiguous impacts. The technology transfer schemes, for example, are inexpensive, user friendly and very popular with users. The OPCEG 1.1 calls on technology transfers were oversubscribed by potential users (see chapter 2.5.3, Table 1b). The numbers of applicants (2951) and support demanded (€1.482.4m) were almost three times higher than the final numbers of beneficiaries (1074) and actual allocations (€530.5m) by October 2014. In the same time technology transfers have the potential for market distortion, corruption and an inefficient allocation of resources.

Challenge 5 on the inadequate national funding of research and innovation remains unaddressed by Slovak R&I policies. The Slovak Government has adopted no realistic commitments on increasing support for research and innovation from public resources. The first versions of the RIS3 document, for example, originally contained detailed budgets for particular policy measures, including details of national support. The final version of the document, however, was passed without any financial specifications by Government Resolution no. 665/2013 on 13 November 2013.

So far only the analytical parts of the [RIS3 document](#) (chapters 2.1-2.6 and 3.1) provided for the comprehensive evaluation of the structural challenges of the Slovak research and innovation system. Chapters 2.1 and 2.2 identify the challenges of dual economy, chapters

⁵³ Source: National Strategic Reference Framework (2015)

2.3, 2.4 and 2.5, 2.6 analyse the weak points of the innovation and research system respectively and chapter 3.1 is a SWOT analysis. The goals and solutions of the abovementioned challenges are set out in chapters 6 and 7 (see chapters 2.2 and 2.7 of this report for more details). The policy mix suggested by the RIS3 document is sufficiently well-articulated for addressing the challenges and particular policy measures may generate synergic effects, if implemented in a proper way. The actual outcomes of the RIS3 policy measures, of course, are yet to be seen.

Table 3: Policy measures addressing structural challenges in the Slovak Republic

(Source: Author's summary)

Challenges	Policy measures/actions addressing the challenge ⁵⁴	Assessment in terms of appropriateness, efficiency and effectiveness
1. Weak R&D system disables co-operation between academia and industry sectors.	The Slovak government used means provided by the Structural Funds and applied policy measures targeting building R&D infrastructure, building linkages between the academia and industry sectors and support for technology transfer.	(+) High numbers of research infrastructure projects (67 Centres of Excellence, 93 R&D Centres, 8 Competence Centres, 11 Science Parks). (+) R&D Centres and national project on R&D information infrastructure perform well. (-) Centres of Excellence are too numerous and face the problem of sustainability. Science Parks are under construction. It is too early to assess their efficiency.
2. Underdeveloped system of innovation governance.	The Slovak Government Council for Science, Technology and Innovation (SGCSTI) started its operation in April 2013. After a 2-year hiatus, Slovakia has a top body for RDI governance.	(+) The SGCSTI is chaired by the Prime Minister and involves all major stakeholders of the Slovak national system of innovation. The council was very active and helped to draft four versions of the RIS3 document in 2013. (-) Regional innovation governance bodies were missing in 2013-14 in Slovakia.
3. Dual economy.	The RIS3 document proposes policy measures aimed at (i) increasing embeddedness by MNCs in the Slovakia's economy; (ii) improving integration of the Slovak firms into the global value chains; and (iii) support for clusters and joint research centres by public and private sectors.	Too early to assess.
4. Low shares of domestic innovative enterprises limit the competitiveness of the country.	Two policy measures were financed from the Operational Programme Competitiveness and Economic Growth (OPCEG) and about €395m was spent by September 2013.	The OPCEG policy measures have impressive budgets, but rather ambiguous results. (+) The technology transfer schemes, for example, are inexpensive, simple-to-implement and very popular with users. They helped create jobs and increase turnovers and exports. (+) At the same time the technology transfer schemes have the potential for market distortion, corruption and inefficient allocation of resources
5. Inadequate national innovation funding.	Innovation policy measures almost completely rely on assistance provided by the Operational Programme Competitiveness and Economic Growth. National innovation spending is 20 times lower than those supported by the OPCEG.	National funding for innovation is extremely low.

⁵⁴ Changes in the legislation and other initiatives not necessarily related with funding are also included.

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Annex 2 - Abbreviations

ASFEU	Agency for Structural Funds of the Ministry of Education, Science, Research and Sports (Agentúra pre štrukturálne fondy Ministerstva školstva, vedy a výskumu SR)
BERD	Business Expenditures for Research and Development
CERN	European Organisation for Nuclear Research
ERA	European Research Area
COST	European Cooperation in Science and Technology
ERA-NET	European Research Area Network
ESA	European Space Agency
ESFRI	European Strategy Forum on Research Infrastructures
FP	European Framework Programme for Research and Technology Development
EU	European Union
EU-27	European Union including 27 Member States
FDI	Foreign Direct Investments
FP	Framework Programme
FP7	7th Framework Programme
GBAORD	Government Budget Appropriations or Outlays on R&D
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
GOVERD	Government Intramural Expenditure on R&D
GUF	General University Funds
HEI	Higher education institutions
HERD	Higher Education Expenditure on R&D
HEIs	Higher education institutions
HES	Higher education sector
IP	Intellectual Property
KEGA	KEGA Grant Agency (Grantová agentúra KEGA)
NADSME	National Agency for Small and Medium Enterprises (Národná agentúra pre malé a stredné podniky)
NRIR	National Research Infrastructures Roadmap
PRO	Public Research Organisations
OECD	Organisation for Economic Co-operation and Development
OPCEG	Operational Programme 'Competitiveness and Economic Growth' (Operačný program Konkurencieschopnosť a hospodársky rast)
OPE	Operational Programme 'Education' (Operačný program Vzdelávanie)
OPRD	Operational Programme 'Research and Development' (Operačný program Výskum a vývoj)
R&D	Research and development
R&I	Research and innovation
RI	Research Infrastructures

RIS3	Research and Innovation Strategies for Smart Specialisation
RNP	Research Networking Programmes
RTDI	Research Technological Development and Innovation
SAS	Slovak Academy of Sciences (Slovenská akadémia vied)
SF	Structural Funds
SIEA	Slovak Innovation and Energy Agency (Slovenská inovačná a energetická agentúra)
SME	Small and Medium Sized Enterprise
SRGBST	Slovak Republic Government Board Council for Science, Technology and Innovation (Rada vlády SR pre vedu, techniku a inovácie)
SRDA	Slovak Research and Development Agency (Agentúra pre výskum a vývoj)
SRDP	State Research and Development Programmes (Štátne programy výskumu a vývoja)
S&T	Science and technology
VEGA	VEGA grant agency (Grantová agentúra VEGA)
VC	Venture Capital

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